INSTRUCTION MANUAL

WEINCHEL

RF UNIT

MODEL 231A, 232A, 233A
234A, 235A, 238A, 242A

MICRO-POWER INC. 25-14 BROADWAY, LONG ISLAND CITY, NEW YORK 11106/(212)726-4060

INSTRUCTION MANUAL

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234A, 235A, 238A, 242A

Serial Number..... 016-1083

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SECTION 1-0

GENERAL INFORMATION

1-1. DESCRIPTION. The RF Unit is designed to be used in conjunction with a Micro-Power 230A SWEEP OSCILLATOR. When the RF unit is plugged into the 230A the performance will be as specified in Section 2-0. See both this manual and the instruction Manual for the 230A SWEEP OSCILLATOR for complete information.

A typical RF unit is illustrated in Figure 1-1. An RF UNIT installed in the 230A SWEEP OSCILLATOR is shown in Figure 1-2.

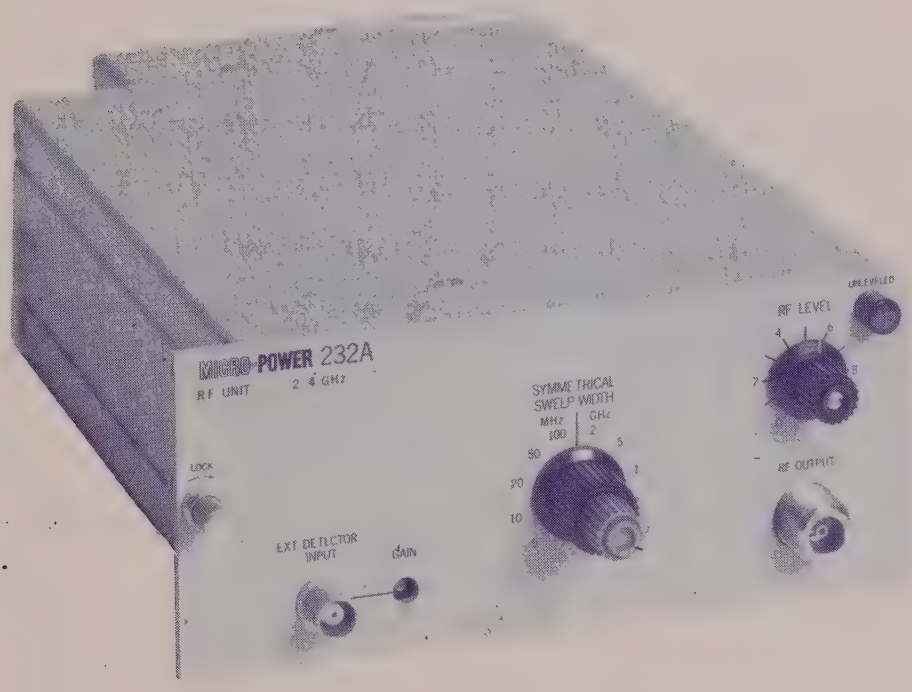

MICRO-POWER 232A
RF UNIT 2-4 GHz
LOCK
EXT DETECTOR INPUT
GAIN
SYMMETRICAL SWEEP WIDTH
MHz
100
GHz
2
5
1
90
20
10
RF LEVEL
UNLEVELED
RF OUTPUT

FIGURE 1-1

FIG.1-2

230A SWEEP OSCILLATOR
WITH RF UNIT INSTALLED

SECTION 2-0

SPECIFICATIONS

2-1. SERIES 230A RF UNITS

Model	Frequency Range GHz	Minimum Power Output mW		Frequency Accuracy @25°C	Power Variation with Internal Leveling[1]	Peak Residual FM,	Frequency Stability				FM Input Rate	Weight
		Ext[3]	Int[1]	MHz	dB	kHz	vs temp %/°C	vs 10 dB change in power MHz	vs ±10% line change kHz	With 3:1 load VSWR all phases MHz	MHz	lbs.
231A	1-2	25	20	± 5	± .3 dB	4	.05	5	10	20	DC-5	5
231A-3[5]	1-2	50	40	± 5	± .3 dB	4	.05	2	10	5	DC-5	6.5
232A	2-4	20	15	±10	± .5 dB	8	.05	1	20	1	DC-0.1	5
234A	8-12.4	6	5	±60	±.75 dB	20	.05	10	80	10	DC-0.1	5.5
235A[6]	12.4-18	3	-	±90	-	30	.05	150	120	150	DC-0.1	5.5
								1*		.1*		
238A[7]	0.01-2	25	20	±10	± .3 dB	4	.05	5**	10	20**	DC-5	8
241A	1.4-2.5	30	20	±10	± .3 dB	6	.05	6	15	25	None	5
242A	1.7-4.2	15	10	±10	± .5 dB	8	.05	1	20	1	DC-0.1	5
243A	3.6-4.3	40	30	± 5	± .2 dB	10	.01	2	30	5	None	5
244A	5.85-6.45	40	30	± 5	± .2 dB	10	.01	3	60	6	None	5

*10-1000 MHz
**1-2 GHz

SEE CHANGE NOTICE ON TIGER TEAM FILE (WORK SHEET)
EXTENDED TO 1 30 MHz

NOTES:
1. For internal leveling, specify Option -1.
2. Specify Option -2 for rear panel RF output on any unit.
3. Power variation with external directional detector on all units is ±0.05 dB, plus directional detector error.
4. Output connectors Type N, except 235A (12.4-18) Type SMA.
5. Same as 231A, but with 20 dB isolator.
6. Internal leveling not available.
7. Model 238B same as 238A except it includes a calibrated attenuator providing leveled absolute power over the range of +13 to -70 dBm with ±2 dB accuracy.
8. Please check with your local Micro-Power representative for current status of additional RF UNITS.
9. See Figure 5-1, GENERAL BLOCK DIAGRAM, for Details on Options.

SPURIOUS SIGNALS: Standard units 40 dB below RF output. Heterodyne Units 30 dB below RF output. Second harmonic 20 dB below RF output.

The specifications of Section 2 of the 230A SWEEP OSCILLATOR are also applicable.

SECTION 3-0

INSTALLATION

3-1. INSPECTION. Carefully inspect RF UNIT immediately upon receipt. Do not discard packing material until satisfied that equipment is undamaged and operating properly. Should shipping damage be found, report claims to carrier immediately.

The equipment may be tested, if desired, for conformance with the specifications of section 2-0 of this manual and of the 230A SWEEP OSCILLATOR manual. Follow the procedures given in Section 6-1 of this manual.

3-2. Installation in 230A SWEEP OSCILLATOR Mainframe. In another RF UNIT is to be removed, first proceed as follows:

(1) Turn off power (eg. via the PUSH ON switch).

(2) Unfasten and remove the dial scale from the mainframe by loosening the two knurled screws.

(3) Rotate the Knurled LOCK Knob on the RF UNIT front panel counterclockwise. Draw the RF UNIT out of the mainframe by pulling on the LOCK thumbscrew.

Then install the new RF UNIT as follows:

(1) Place the new dial scale (furnished with RF UNIT) on the mainframe and fasten it by its two thumbscrews.

(2) Rotate the knurled LOCK knob on the RF UNIT front panel counterclockwise. Insert the RF UNIT into its compartment within the mainframe until its front panel is flush with the mainframe panel.

(3) Rotate the knurled LOCK knob fully clockwise.

(4) Power may now be turned on. The equipment is ready for operation immediately.

3-3. REPACKING FOR SHIPMENT. Follow procedure of Section 3-4 of the 230A SWEEP OSCILLATOR Instruction Manual.

3-4. The equipment warranty furnished by Micro-Power is given on a separate form at the rear of this manual.

SECTION 4-0

OPERATION

CAUTION: The RF OUTPUT power level exceeds the rating of many standard detectors. The operator should therefor insert appropriate attenuation when used with thermistor mounts, bolometers or low power diode detectors to avoid burnout.

4-1. INTRODUCTION. The Series 230A RF UNITS are all solid state RF signal sources for CW and swept measurements. It is designed for use in the 230A SWEEP OSCILLATOR Mainframe, whose Instruction Manual covers the mainframe itself, the RF UNIT with mainframe, and certain aspects of the RF UNIT. The following paragraphs describe operation of the RF UNIT not covered in the 230A SWEEP OSCILLATOR instruction Manual.

4-2. CONTROLS, INPUTS AND OUTPUT. For standard units see Section 4-2 of the 230A SWEEP OSCILLATOR instruction. Manual.

4-3. FM INPUT. This input can be used to direct couple wide band signals to the RF oscillator. This permits phase locking to an external frequency reference using a suitable synchronizer, stabilizer or "lock box". The upper frequency response limit is given in Section 2-0. Positive going voltage causes RF frequency to increase; negative to decrease. Modulation sensitivity is 20 MHz/volt for YIG tuned units. Varactor tuned units exhibit greater sensitivity at the low end of their frequency range; lower sensitivity at the high end. Deviation up to the band edge is permissible. YIG tuned units maintain a constant modulation sensitivity.

4-4. FREQUENCY RANGE SELECTOR. RF UNITS which provide more than one frequency range in a single plug-in unit include a front panel FREQUENCY RANGE selector switch. Its Dial Scale calibrations are direct reading for each band without computation.

4-5. SIGNAL GENERATOR RF LEVEL CONTROL. Signal generator RF UNITS have coaxial calibrated RF LEVEL controls. Both knobs are calibrated directly in dBm. When internal leveling is employed the power provided at the RF OUTPUT connector is the algebraic sum of the two readings. Interpretation is simplified by color coding +dBm readings in red, while -dBm values are in black. The calibrating adjustment trimmer is located inside the RF UNIT.

4-6. CRYSTAL CALIBRATOR. RF UNITS featuring crystal calibration provide a rear panel EXT CAL INPUT for operator introduction of standard frequency. Built-in crystal controlled calibration frequencies are operated via the front panel XTAL CALIB on off switch, marked with the applicable frequency. Example: 5 MHz XTAL CALIB.

SECTION 5-0
PRINCIPLES OF OPERATION

The RF UNIT contains the electrically tunable RF oscillator with circuits for controlling its frequency and output amplitude. The General Block Diagram of Figure 5-1 illustrates a typical RF UNIT together with the major functions of the 230A SWEEP OSCILLATOR mainframe. See Section 5-0 of the mainframe Instruction Manual for its principles of operation. The following paragraphs discuss aspects unique to the RF UNIT itself.

5-1. RF OSCILLATOR. RF power originates in the oscillator. The oscillator requires bias power to energize it and tuning signal to set its RF frequency. Oscillators used in the Series 230A RF Units include transistor and microwave bulk effect diodes, usually tuned by voltage variable capacitors (varactors) or by magnetically tuned resonators (YIG).

5-2. BIAS SUPPLY. The bias supply, illustrated in Fig. 5-2, consists of an unregulated DC input from the mainframe, the series pass regulating transistor with its driver and current limiter located in the mainframe for positive bias, or in the RF UNIT for negative bias, and a difference amplifier in the RF UNIT, which continuously compares the regulated bias with the reference voltage supplied from the mainframe. A fuse in the RF UNIT protects against failures which might disable the electronic current limit feature. The overvoltage protective crowbar circuit places a short circuit across the oscillator bias terminals in the event of even momentary overvoltage. Primary power must be interrupted to reset the crowbar. A zener diode across the oscillator protects it from reverse voltage and from loss of protection should the crowbar fail.

5-3. TUNING SUPPLY. Tuning supply provides either tuning voltage or tuning current, as appropriate to the RF oscillator used.

5-4. YIG TUNING SUPPLY. The requirement on the YIG supply is that current through its load, the YIG tuning coil, be proportional to the tuning voltage command input. This is accomplished by placing a resistor in series with the coil; its IR drop is a voltage proportional to YIG tuning coil current. By comparing this voltage drop with its tuning voltage command input, the supply regulates the voltage drop across the sensing resistor, hence also regulates the YIG tuning coil current.

As shown in Fig. 5-3 the YIG tuning supply consists of an unregulated DC input from the mainframe, series pass transistor driven by an error amplifier, sensing resistors and a response time circuit. The latter introduces lag in the supply by a lead in the negative feedback path, which attenuates response to input noise and ripple, when activated in either the CW mode or when the rear panel SWEEP RESPONSE TIME selector is set to SLOW.

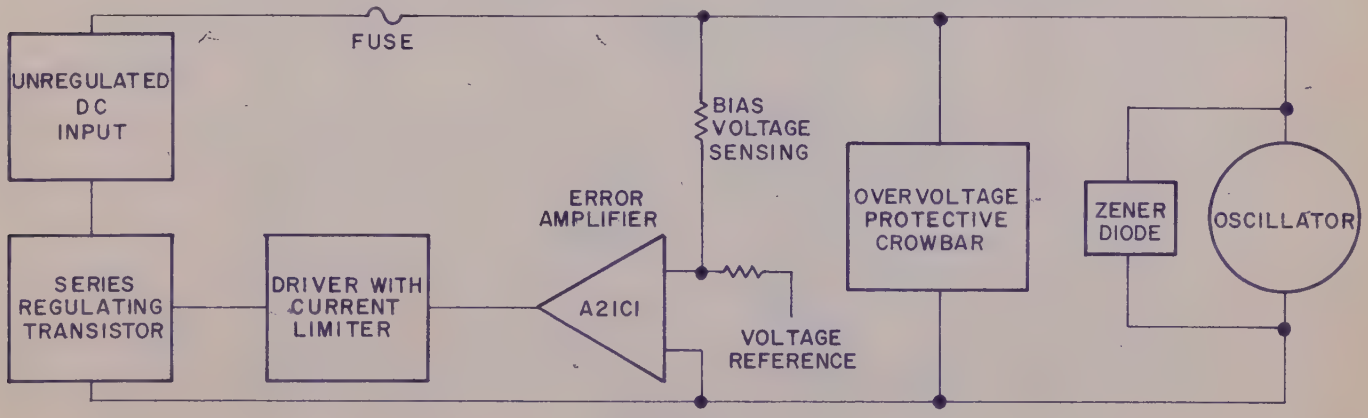
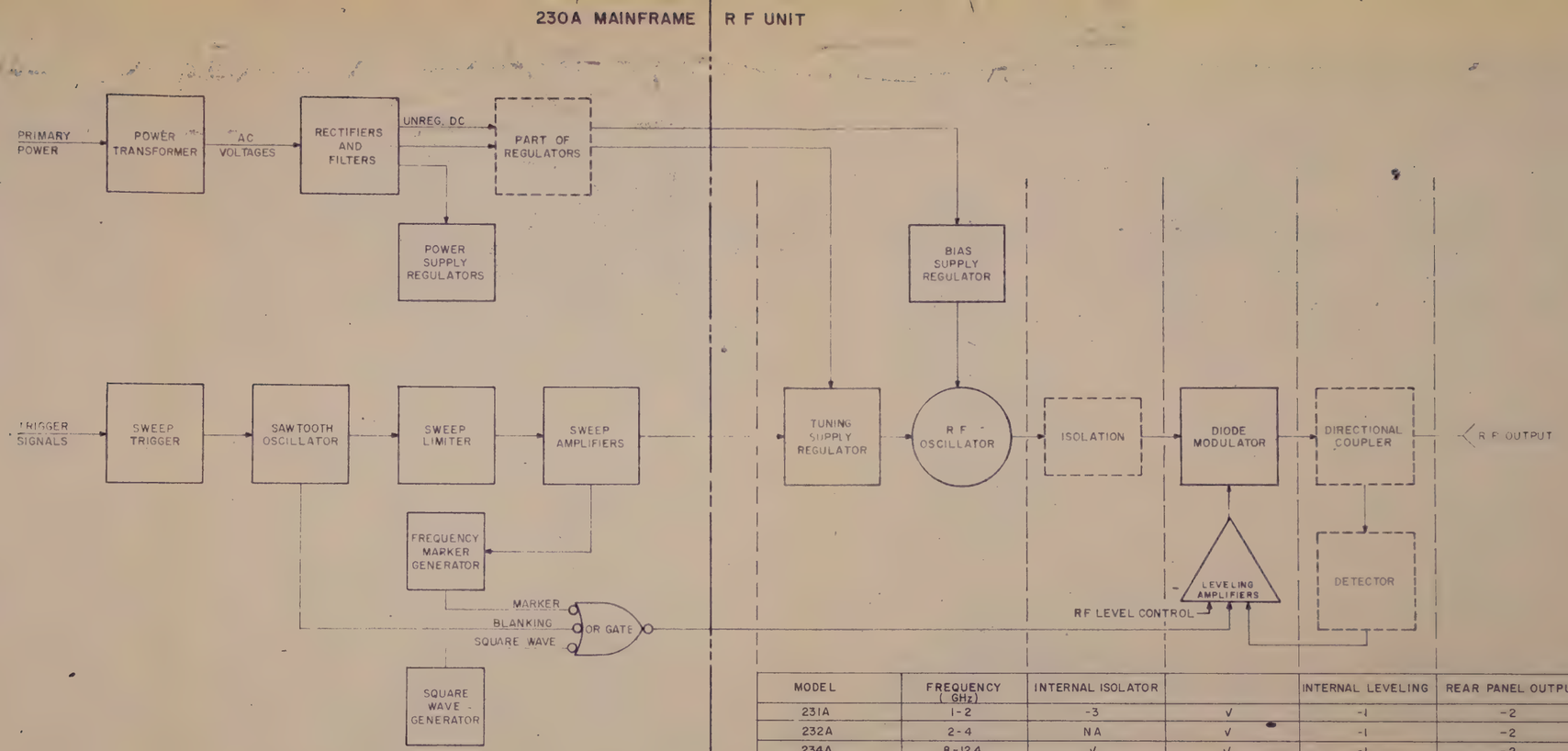


FIGURE 5-2



MODEL	FREQUENCY (GHz)	INTERNAL ISOLATOR		INTERNAL LEVELING	REAR PANEL OUTPUT
231A	1-2	-3	V	-1	-2
232A	2-4	NA	V	-1	-2
234A	8-12.4	V	V	-1	-2
235A	12.4-18	V	V	-1	-2
241A	1.4-2.5	NA	V	-1	-2
242A	1.7-4.2	NA	V	-1	-2
243A	3.6-4.3	NA	V	-1	-2
244A	5.85-6.45	NA	V	-1	-2

FIG 5-1

GENERAL BLOCK DIAGRAM

MODEL 230A WITH RF UNIT

LEGEND

V = INCLUDED

-1, -2, -3 } OPTION NUMBERS

NA = NOT APPLICABLE

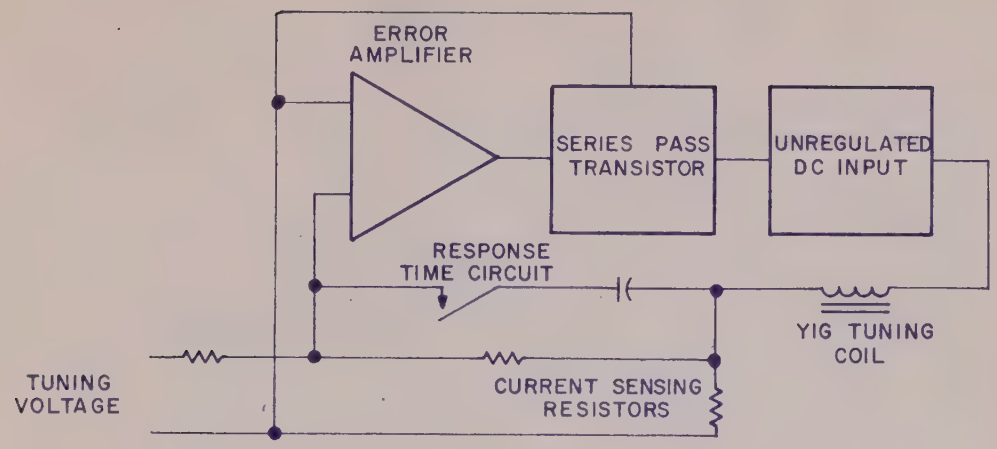


FIGURE 5-3

5-5. VARACTOR TUNING SUPPLY. Fig. 5-4 shows the block diagram of the Varactor type Tuning Supply, used for voltage tuned RF oscillators. The supply consists of a 200V UNREGULATED DC INPUT with PREREGULATING SERIES PASS TRANSISTOR, both located in the mainframe, and ERROR AMPLIFIER with PASS TRANSISTORS connected in a closed loop feedback system. The reference for this supply is the tuning voltage command input, provided from the mainframe.

Since the RF frequency vs varactor voltage is usually not linear, a linearizing DIODE SHAPING NETWORK is incorporated in the negative feedback path of the varactor tuning supply to provide a linear relationship between tuning voltage command input and the frequency produced by the RF oscillator. This linearizing network functions as follows:

A portion of the output voltage appears across the DIODE NETWORK and as the output voltage increases more diodes become forward biased. As each additional diode conducts the incremental reduction in feedback increases the output vs input slope. By suitable choice of resistors associated with the diodes, the output vs command input voltage curve can be shaped to provide the desired linear relationship between command input and RF frequency.

The response time circuit introduces a time lag in the supply (by a lead in the negative feedback path) which attenuates response to any input noise and ripple, when activated in either the CW mode or when the rear panel SWEEP RESPONSE TIME selector is set to SLOW.

5-6. FM INPUT. Frequency modulation at a higher modulating frequency than the tuning supply can handle is provided via an alternate path to the RF oscillator.

The voltage variable capacitor used in a varactor tuned RF oscillator has two terminals. One is connected to the tuning supply; the other to the FM INPUT connector with suitable RF decoupling. Thus the potential difference across the varactor is the difference between the tuning supply output and the FM INPUT signals. Consequently the RF oscillator frequency is determined by the tuning supply setting, on which is superimposed the FM INPUT contribution.

YIG tuned RF oscillators are inherently limited in the upper modulating frequency to which the magnetic tuning core can respond. An auxilliary winding is used to perturb the YIG resonator magnetic field intensity via

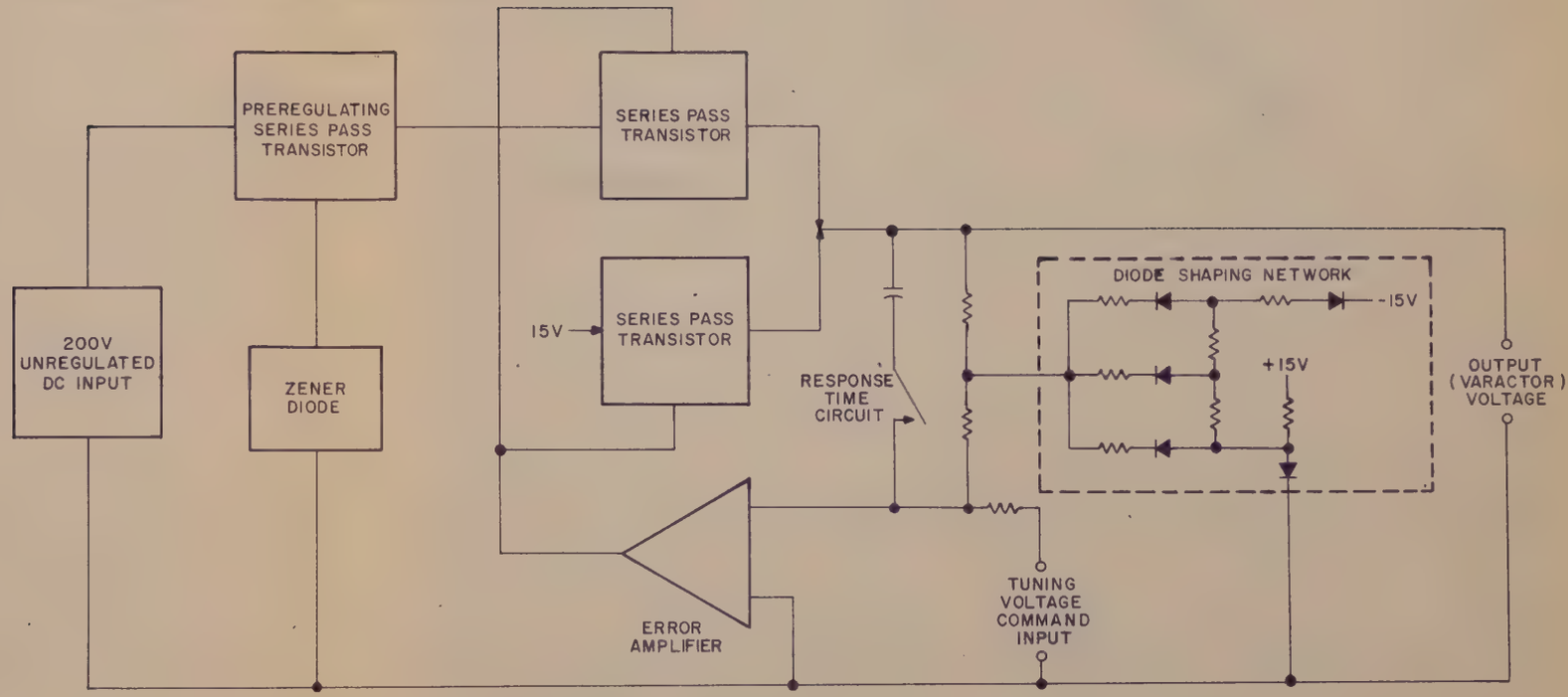


FIG. 5-4
VARACTOR TUNING SUPPLY BLOCK DIAGRAM
RF UNIT

essentially air core coupling for wide frequency response. This auxiliary winding is driven by an FM AMPLIFIER in the RF UNIT, which is AC coupled to the FM INPUT connector. DC and low frequency modulation is summed into the main tuning supply via a direct coupled path from the FM INPUT. Thus the FM INPUT dynamic range for DC and low frequencies is sufficient to cover the entire range of the RF oscillator.

5-7. LEVELING. RF amplitude may be maintained constant across the frequency band by means of the closed loop leveling system, illustrated in Figure 5-5. The reference for this system is the DC voltage set by the RF LEVEL potentiometer. This is compared against the output of the DETECTOR, which converts the RF output sample from the DIRECTIONAL COUPLER to a negative feedback DC signal. Any error signal is amplified and used to drive the DIODE MODULATOR, which attenuates the RF OSCILLATOR output to the required amplitude.

The RF LEVEL potentiometer voltage is modulated by markers, square wave and blanking waveforms. The internally generated frequency marker can be used to decrease the RF amplitude, and appears as a sharp dip in power on the swept display. When the internal 1 KHz ⊓⊔ is ON, the RF LEVEL potentiometer DC voltage is removed on negative half cycles of the square wave. This appears on the display as removal of RF output during that half of the square wave. The blanking signal can also be introduced to remove RF output from the display during retrace. This provides a "zero" base line reference on the display.

When the DETECTOR employed is a power meter (with thermistor or bolometer head) the LEVELING MODE selector introduces a negative feedback stabilizing time constant in the error amplifier. The response time is deliberately limited to accommodate the power meter time constant. This means that SWEEP TIME (SEC) selection is limited to the region between 10 and 100 seconds. Modulation of RF markers and square wave is then introduced after the slow responding amplifier. The response time of the leveling loop is too long to follow 1 KHz square wave modulation, so the average power will be regulated. Since the duty factor is 50%, the peak power with square wave modulation will be twice the average power. RF DURING RETRACE should be left ON for best results when power meter leveling.

5-8. HETERODYNE RF UNIT. The arrangement of components for heterodyne operation is shown in block diagram form in Fig. 5-6. The RF from a fixed and from a swept oscillator are combined in a mixer. The difference frequency is amplified and provides the RF output. Leveling is applied only to the fixed frequency oscillator, including RF LEVEL adjustment and modulation.

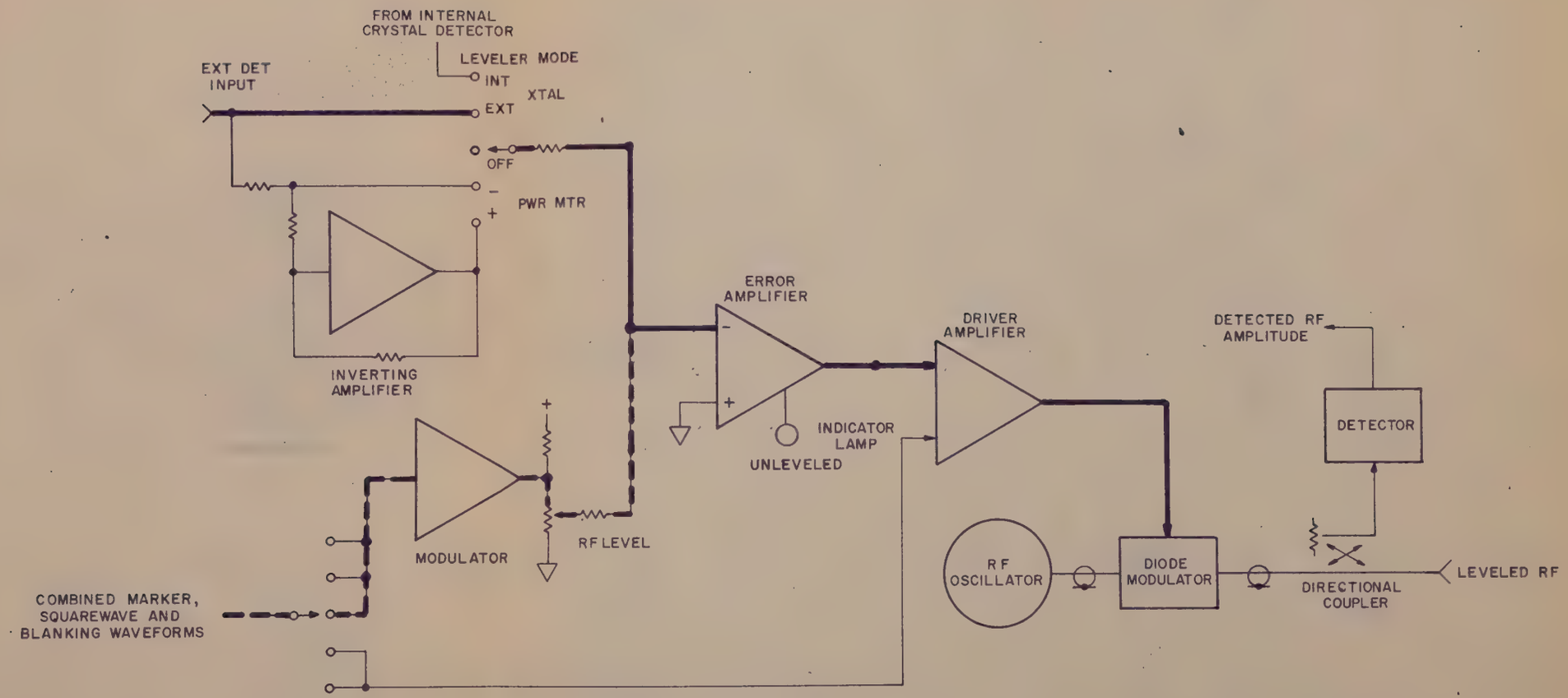


FIG 5-5

LEVELING SYSTEM
BLOCK DIAGRAM

RF UNIT

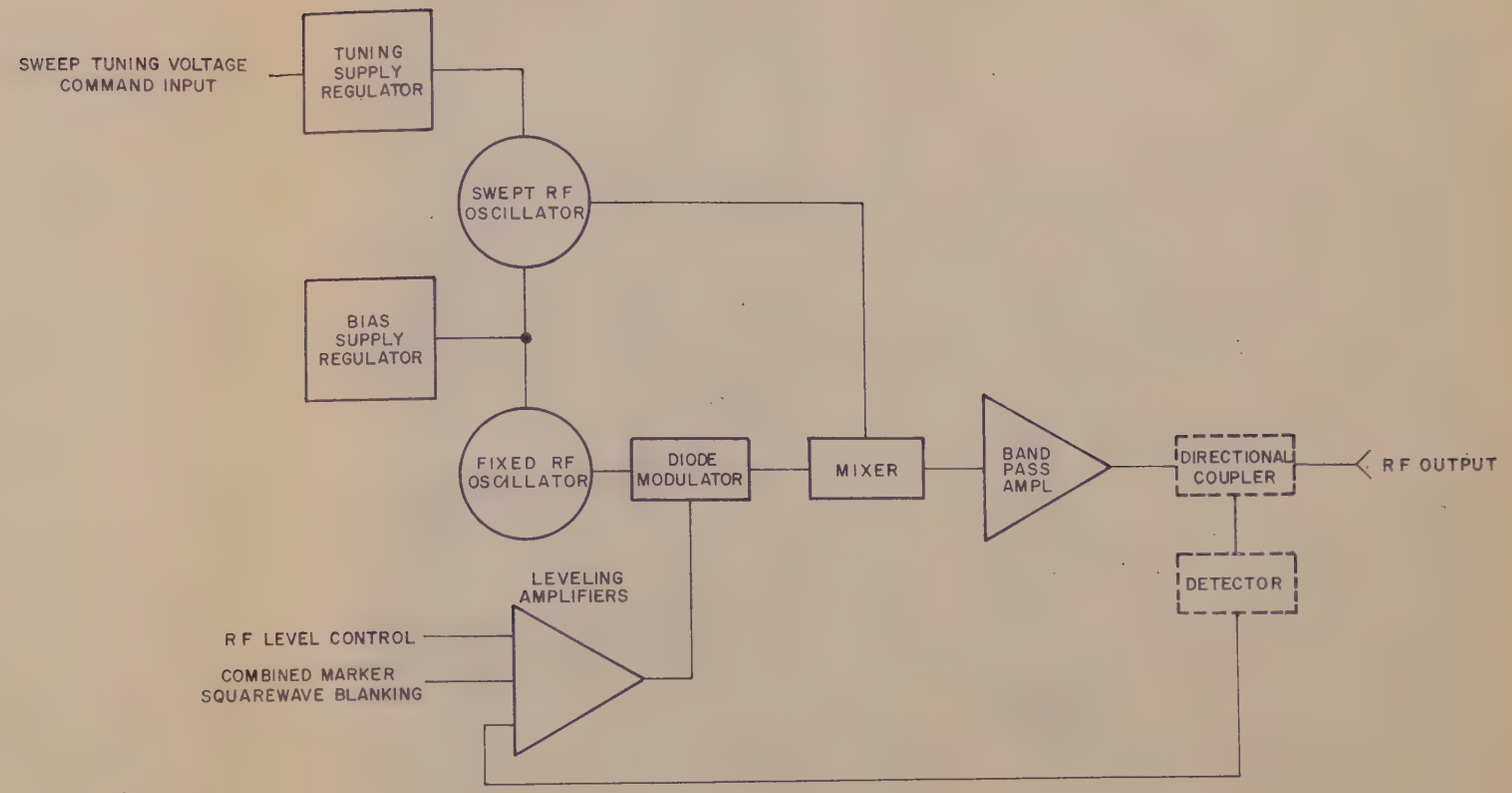


FIG. 5-6

HETERODYNE RF UNIT
BLOCK DIAGRAM

RF UNIT

SECTION 6-0

MAINTENANCE

6-1. PERFORMANCE TESTS. Tests normally suggested to check the instrument against its specifications for incoming inspection, periodic maintenance and after servicing are given in Sections 6-2 through 6-14 of the 230A SWEEP OSCILLATOR MANUAL. In addition, the following sections of this manual detail further performance tests which may be desirable. Table 6-1 lists the test equipment required.

6-2. SPURIOUS SIGNALS

a. Connect the RF OUTPUT to the spectrum analyzer input. A 10 dB attenuator pad should be used to avoid burn-out of the spectrum analyzer input.

b. Set the SWEEP OSCILLATOR controls as follows:

M1	midband (or any specific frequency to be investigated)
SWEEP FUNCTION	CM M1
1KHz ⊓	off
RF LEVEL	maximum clockwise

c. Observe the amplitude at the desired RF frequency, and at any spurious and harmonic frequency of interest. Follow the manufacturer's directions to distinguish spurious responses of the analyzer from those of the SWEEP OSCILLATOR.

d. The unwanted responses should conform with Section 2-1 of this instruction manual.

6-3. FREQUENCY STABILITY. Stability tests should be conducted in a temperature stable location free from drafts. Warm-up of at least 15 minutes should be completed prior to measurements.

6-4. VS 10 dB CHANGE IN POWER.

a. Connect the equipment per Fig. 6-1. A high resolution frequency meter may be substituted for the spectrum analyzer.

b. Set the SWEEP OSCILLATOR controls as follows:

M1	midband (or any specific frequency to be investigated)
SWEEP FUNCTION	CW M1
1 KHz ⊓	off
RF LEVEL	maximum clockwise
LEVELER MODE	INT or OFF

c. Observe the power meter reading in dB, and the RF frequency indication. Reduce the power by 10 dB via the RF LEVEL control.

d. Note the change in frequency indication. It should not exceed the specification of Section 2-1.

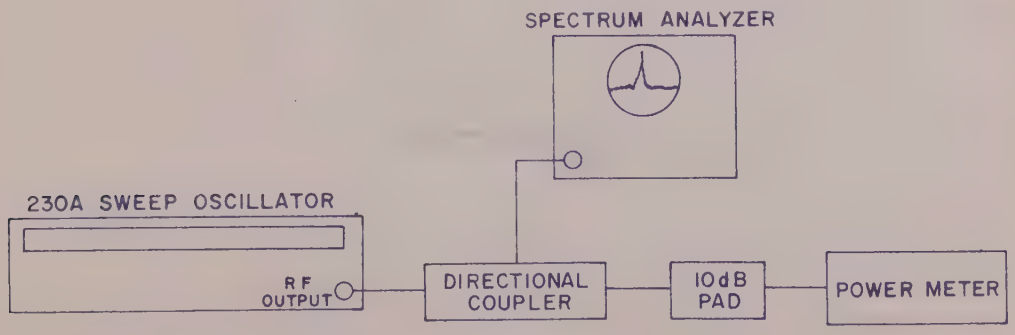


FIGURE 6-1

TABLE 6-1

TEST EQUIPMENT
FOR PERFORMANCE TESTING

Note: See also Table 6-1 of 230A SWEEP OSCILLATOR Instruction Manual

TITLE	REQUIREMENTS	SUGGESTED MFR. AND MODEL NO.
Adjustable Length Line	0.2 dB max. Insertion Loss. 12 inch Travel	Microlab/FXR SR-05N
Short Circuit Termination	Less than 0.5 ohm	Microlab/FXR TR-5MN
Spectrum Analyzer		HP Model

TABLE 6-2

TEST EQUIPMENT
FOR CALIBRATION

See Table 6-2 of 230A SWEEP OSCILLATOR Instruction Manual.

6-5. VS 3:1 LOAD VSWR

a. Connect the equipment per Figure 6-2. The combined insertion loss of the coupler and pad in the main line is to be 3 dB. Thus a 3 dB coupler and no pad or a 10 dB coupler and a 2½ dB pad are suitable combinations.

b. Set the SWEEP OSCILLATOR controls as in Section 6-4 above.

c. Observe the peak to peak change in frequency indication as the adjustable length line is varied over at least ½ wavelength. Divide by two.

d. The maximum allowable result is given in Section 2-1.

6-6. VS ±10% LINE CHANGE

a. Connect equipment per Figure 6-3.

b. Set SWEEP OSCILLATOR controls per 6-4 above.

c. Adjust the AC line input over the range 105 to 125 volts RMS (or 210 to 250 if applicable). Note the peak to peak change in frequency indication. Divide by two.

d. The maximum allowable result is given in Section 2-1.

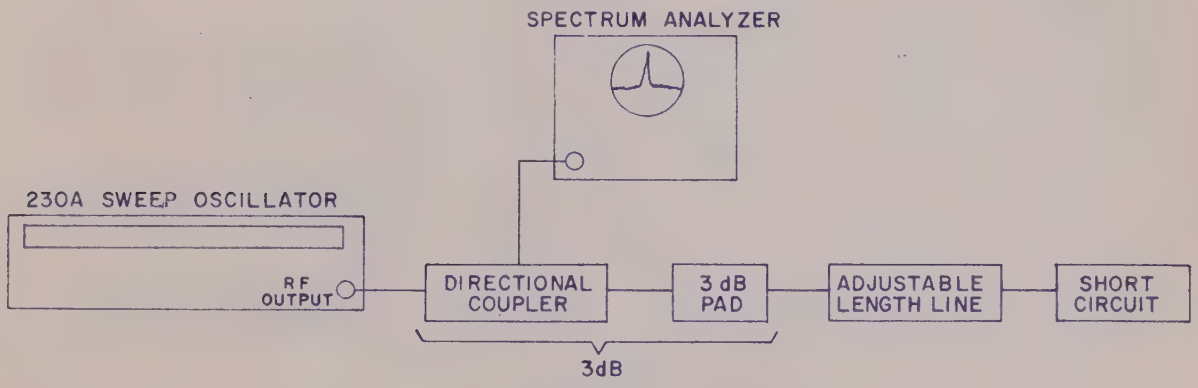


FIGURE 6-2

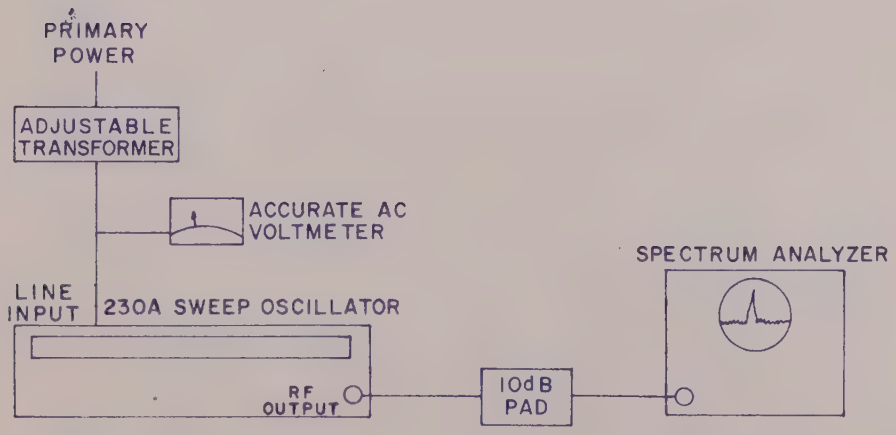


FIGURE 6-3

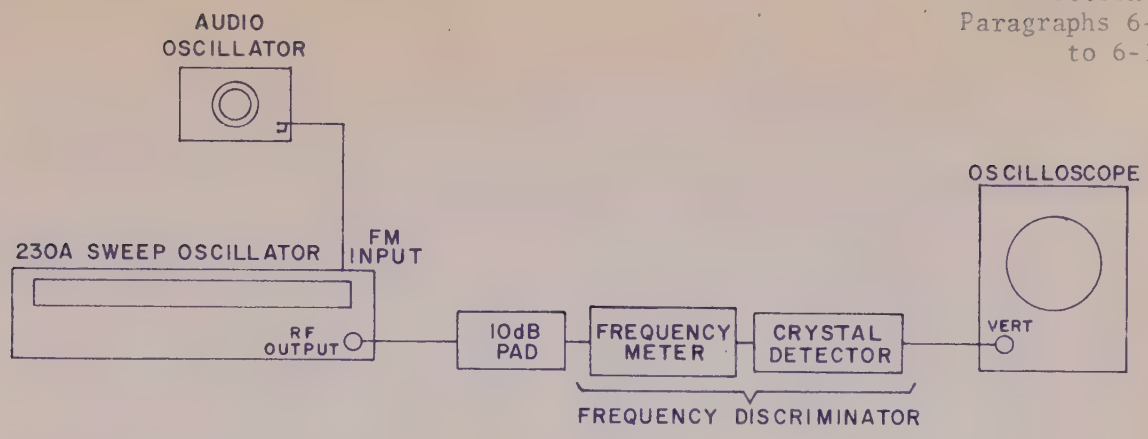


FIGURE 6-4

6-7. FREQUENCY MODULATION.

a. Connect equipment per Fig. 6-4.
b. Set the Sweep Oscillator controls as follows:

SWEEP FUNCTION	SYM M1
SWEEP TIME	MAN
SYMMETRICAL SWEEP WIDTH	MAX CCW
M M1	CENTER OF RANGE

c. Set the audio oscillator output for approx. 0.5 volts peak to peak.
d. Observe demodulated FM on oscilloscope. Measure the demodulated FM to be continuous from DC to the specific FM input frequency rate in Section 2.

6-8. REMOTE TUNING

a. Connect equipment as in Figure 6-5.
b. Set the SWEEP OSCILLATOR controls as in Section 6-2(b).
c. Remove the shorting link from the RF UNIT rear panel terminal strip A7TB3 terminals 2 and 3. Apply one volt DC between terminals 2 and 3 where terminal 3 is at ground potential.
d. The change in RF frequency should be 1/10 of full band of the RF Unit, increasing for positive input.
e. Replace the shorting link.

6-9. PULSE INPUT

a. Connect the equipment per Figure 6-6.
b. Set the SWEEP OSCILLATOR controls as follows:

M1	midband
SWEEP FUNCTION	CW M1
1 KHz ⊓	off
RF LEVEL	maximum counterclockwise
LEVELER MODE	OFF

c. Apply pulse amplitude sufficient to reach full RF output.
d. The required pulse amplitude should not exceed 10 volts. The RF pulse rise and fall times should be less than 1 microsecond.

6-10. REMOTE LEVEL

a. Connect the equipment per Fig. 6-7. Remove shorting jumpers from RF UNIT rear terminal strip A7TB3 terminals 4 and 5 and from 6 and 7.
b. Set the SWEEP OSCILLATOR controls as follows:

F1	low end of scale
TRIGGER	LINE
SWEEP FUNCTION	F1-F2
SWEEP TIME(SEC)	.01
F2	high end of scale
1 KHz ⊓	OFF

c. Adjust the potentiometer. RF amplitude should be controllable from full output through leveled to minimum power output. Replace the jumpers when the remote level control is disconnected.

6-11. CALIBRATION PROCEDURES.

A calibrated 230A SWEEP OSCILLATOR mainframe is required for a calibration of the RF UNIT. Test equipment required for calibration is listed in Table 6-2.

Turn power off. Remove the top cover from

both the mainframe and the RF UNIT. Replace the RF UNIT in the mainframe, turn power on. Allow a 15 minute warm-up period before proceeding with calibration.

6-12. FREQUENCY ADJUSTMENT

a. Connect the equipment per Fig. 6-5. Do not apply voltage to the REMOTE TUN INPUT. Leave the shorting link in place on A7TB3, rear panel terminal strip of the RF UNIT, between terminals 2 and 3.

6-13. YIG TUNING SUPPLY.

a. Set the SWEEP OSCILLATOR controls as follows:

F1	low end of scale
M1	nominal low end of band exactly on scale division
M2	nominal high end of band, exactly on scale division
F2	high end of scale
TRIGGER	LINE
MARKER AMPLITUDE	as desired
SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	.1
1 KHz ⎍	off
RF LEVEL	maximum clockwise*
LEVELER MODE	OFF*
SWEEP RESPONSE TIME	NORMAL

*) If RF UNIT features Option -1 (internal leveling) set LEVELER MODE to INT and adjust RF LEVEL just counterclockwise enough so that RF amplitude is leveled across the nominal frequency band.

b. Set the frequency meter to the scale reading of M1. Adjust RF UNIT A2R54 to make the frequency meter dip and the marker dip coincide on the oscilloscope display. Set the frequency meter to the scale reading of M2. Adjust A2R12. Repeat until both frequencies are set within ¼ of the specification frequency accuracy tolerance.

6-14. VARACTOR TUNING SUPPLY

a. Connect the equipment per 6-12a. above.

b. Set the SWEEP OSCILLATOR controls as in 6-13a. above.

c. Set the frequency meter so that its dip on the oscilloscope display coincides with the M1 marker dip. Note its reading. Reset the M1 marker to other frequencies of interest (e.g. midband and the high end of the nominal band) and repeat.

Potentiometer A2R54 may be adjusted to shift the entire band either higher or lower in frequency.

6-15. LEVELER

a. Connect the equipment per Fig.6-6 with the frequency meter and Pulse Gen. omitted.

b. Set the SWEEP OSCILLATOR controls as follows:

MARKER AMPLITUDE	maximum counterclockwise
TRIGGER	LINE
SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	.1
1 KHz ⎍	off
LEVELER MODE	OFF
RF DURING RETRACE	OFF

c. Set zero adjust so that when the RF LEVEL control is fully counterclockwise the RF amplitude displayed just reaches the minimum.

d. Change LEVELER MODE to EXT XTAL. See that when the RF LEVEL control is rotated to its fully counterclockwise position the RF amplitude displayed reaches minimum. If not, reset A1R12 so that it does.

6-16. SERVICING. Removing the covers from the RF unit provides access to its interior. Its plug-in cards, whose functions are printed on the underside of the top cover, may be exchanged or checked.
With top and bottom covers removed from both the RF UNIT and the Mainframe the equipment may be operated normally, with access to its test points. When inserting an RF UNIT without covers into the Mainframe, guide it into place to properly engage the 36 pin connector

6-17. MAJOR REPAIR - Preliminary Calibration.

The preliminary calibration procedure described below should be followed when repairs have been made on the chassis harness or if an RF Oscillator is replaced.

(1) Disconnect RF Oscillator. Remove wires at terminal board A7TB2. Terminal numbers are indicated in Fig. 6-8.

(2) Clean contact fingers of all P.C. boards.

(3) Plug RF unit into 230A mainframe with RF unit covers removed.

(4) BIAS SUPPLY

a. Connect a 1/2% accurate Voltmeter (Simpson Model 1700) between terminal A7TB2-5 and chassis ground. Turn the power on and measure the voltage to be within 1% of the bias voltage specified in Fig. 6-9. For the 234A RF unit, resistor A2R55 must be selected so that the bias voltage is within 1% of the value specified on the label of the RF oscillator. A typical value of A2R55 is 10K for a bias of 10 volts.

b. Check other voltages indicated in Fig. 6-9 for applicable RF unit.

(5) CROWBAR CIRCUIT

a. Turn power off, from Fig. 6-9 determine the required bias voltage and its polarity. Using an external variable voltage DC power supply capable of delivering the required bias voltage, connect one lead of the power supply in series with a 330 ohm, 2 Watt resistor to A7TB2-5 and other power supply lead to ground observing the specified polarity.

Connect a 1/2% accurate voltmeter between A7TB2-5 and chassis ground. With the AC power into 230A still off, set the voltage from external DC to be 5% above the bias voltage specified for the RF Oscillator. Select a value for A2R68 (typically 6.5K ohms for bias voltage of 20 volts) so that the crowbar circuit is actuated as measured by a low voltage reading on the voltmeter.

b. Recheck the crowbar setting by reducing the external DC voltage to zero and then increasing it and measuring the crowbar trip voltage to be between 4% and 5% above the specified bias voltage.

c. Turn power on and connect the oscilloscope input terminals across the bias supply output terminals A7TB2-5 and chassis ground. Place a short circuit across these terminals and observe that there is no overshoot on the bias supply voltage when the short circuit is applied or removed.

(6) 200 VOLT SUPPLY (Varactor Tuned Units).

Measure the DC voltage at A7P1-19 to be minus 75 volts with respect to ground.

(7) TUNING SUPPLY

a. Set the sweep oscillator controls as follows:

SWEEP FUNCTION	CW (M1)
M1	nominal low end of band exactly on scale division

b. Yig Tuned. Set current in tuning coil at low frequency end of band using A2R54 adjustment and measure voltage across A4R1 indicated in Fig. 6-9.

Set M1 at nominal high end of band, exactly on scale division. Set current at high frequency end using A2R12 adjustment and measuring voltage across A4R1 indicated in Fig.6-9.

c. Varactor Tuned. Set tuning voltage at low frequency end of band using A2R54 adjustment and measuring the tuning voltage at A7TB2-6 indicated in Fig. 6-9.

For initial installation of an RF Oscillator, the diode-resistor shaping network may have to be re-specified. In this event the unit should be returned to the factory for recalibration.

(8) Install and connect RF Oscillator.

(9) Go to 6-11 through 6-15.

(10) Go to 6-1 through 6-10.

(11) The following paragraph designation refers to the manual for the 230A Sweep Oscillator.

Go to 6-3 (230A) through 6-8 (230A).

(12) Go to 6-14 (230A) through 6-19 (230A).

(13) Go to 6-23 (230A).

Calibration is now complete.

Model	RF Frequency Range GHz	Type of Tuning	Terminal Number on A7TB2		Comment
			Bias	Tuning	
238A,B	.01-2	Varactor	5	6	
231A	1-2	Varactor	5	6	
232A	2-4	Yig	3, 5	1, 2	Place short circuit jumper across 1, 2
242A	1.7-4.2	Yig	3, 5	1, 2	"
234A	8-12.4	Yig	5	1, 2	"
235A	12.4-18	Yig	5	1, 2	"

Bias and Tuning Supply Connections

Figure 6-8

Model	RF Freq. Range GHz	Type of Tuning	Bias		Nominal Tuning Voltage, Volts		Terminal Number
			Voltage Volts	Terminal No. on A7TB2 (No.4 is gnd.)	Low Freq. End	High Freq. End	
238A,B	.01- 2	Varactor	+24	5	+0.5	-60	A7TB2-6
231A	1- 2	Varactor	+24	5	+0.5	-60	A7TB2-6
232A	2- 4	Yig	+20V - 5V	5 3	- 5.5	-11	A4R1 (68.1 ohm)
242A	1.7- 4.2	Yig	+20V	5	- 4.6	-11.5	A4R1 (68.1 ohm)
234A	8-12.4	Yig	WJ-10V* VA+16V*	5	- 7.5 - 5.3	-11.6 - 8.2	A4R1 (15 ohm) A4R1 (15 ohm)
235A	12.4-18	Yig	WJ-10V* VA+15V*	5	-10.9 - 8.0	-15.9 -11.6	A4R1 (15 ohm) A4R1 (15 ohm)

WJ - Watkins Johnson
VA - Varian Associates
* Approximate values, see label on RF Oscillator for exact value.

Bias and Tuning Supply Voltages

Figure 6-9

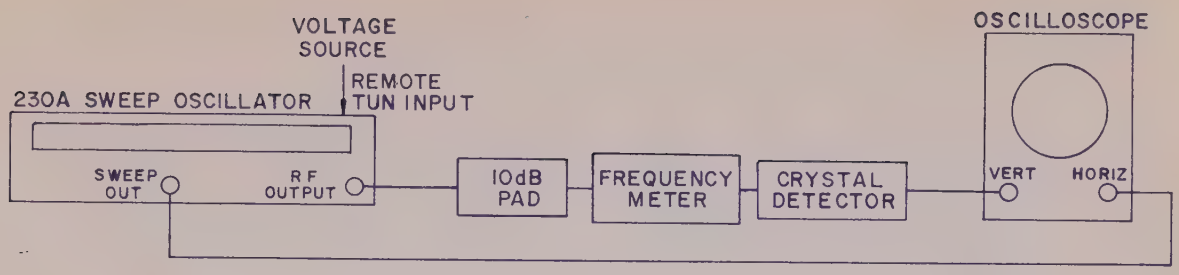


FIGURE 6-5

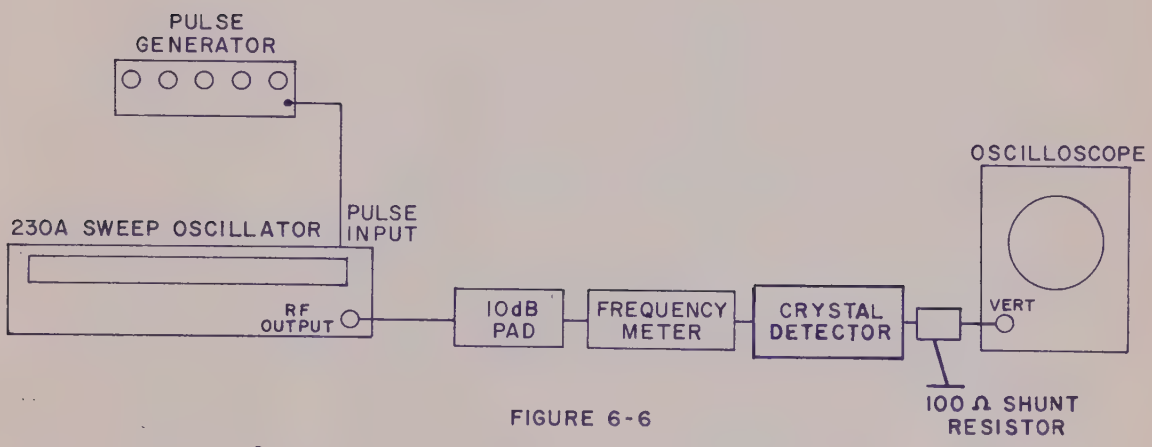


FIGURE 6-6

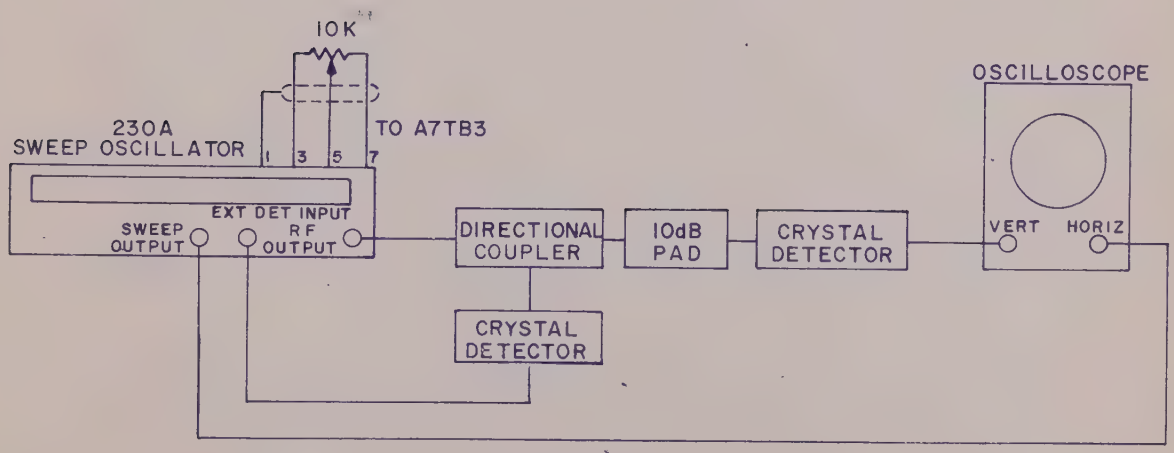


FIGURE 6-7

TABLE 6-3

TROUBLE SHOOTING SYMPTOMS

Note: See also Table 6-3 of 230A SWEEP OSCILLATOR Instruction Manual

SYMPTOM	TROUBLE LOCATION	PROBABLE CAUSE
No RF output	Bias supply	Low or no bias voltage
	Tuning Supply	Too low or too high
	Leveling amplifier	Turn-off bias applied to diode modulator
	Coaxial cable or connector	Defective
	Diode modulator	Defective
	RF oscillator	Defective
No control of RF level	Leveling amplifier	Defective component
	Diode modulator	Defective
No Leveling	Directional detector	Defective diode or connection
High residual FM in CW mode	Tuning supply	Low gain Excessive ripple Defective relay
Frequency Calibration	Mainframe	Requires calibration
	Tuning supply	Defective component

TABLE 6-4

TROUBLE SHOOTING THE BIAS SUPPLY

6-4. POSITIVE BIAS SUPPLY

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
1	High output	Measure -15V	High voltage	Defective reference supply
			Normal voltage	Proceed to step 2
2		Measure voltage from A7Q1 base to emitter	Less than -½V	Shorted A7Q1
			More than -½V	Proceed to step 3
3		Measure voltage from A2Q8 base to chassis	Less than -1V	Defective A2Q8
			More than -1V	Proceed to step 4
4		Measure voltage from A2IC1-5 to A2IC1-4 (return)	Pin 5 more than +0.1V	A2IC1 defective
			Pin 5 more than -0.1V	Defective A2R55 or A2R56
			Pins 4 and 5 within ±0.1V	Shorted CR32 or 33 or defective IC1
5	Low output	Localize cause	Between ½ and 1V	Proceed to step 6
			Otherwise	Proceed to step 9
		Feel A2CR20	Cold	Proceed to step 9
			Warm	Protective crowbar circuit conducting proceed to step 7
7		Turn primary power off, than on again. Recheck bias supply voltage	Normal (refer to oscillator data sheet in front of manual for normal bias supply voltage)	Crowbar was energized by a transient or an intermittent failure
			Between ½ and 1V	Disconnect oscillator from A7TB2. Proceed to step 8

6-4. CONT'D

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
8	Low output (cont'd)	Turn power off. Remove A2R68. Turn power on	Bias supply voltage from ½ to 1V	Defective A2Q9 or A2CR20
			Bias supply voltage higher than normal	Proceed to step 1. After repairing failure, reinstall A2R68, verify normal bias voltage and reconnect RF oscillator to A7TB2
9		Measure -15V Reference voltage	Low voltage	Defective reference supply
			Normal voltage	Proceed to step 10
		Measure voltage from A7Q1 collector to chassis	Less than -1½V	Defective A7F1 or A7CR1, low or no unregulated input to bias supply from mainframe
			More than required bias voltage	Proceed to step 10
10		Measure voltage from A7Q1 base to chassis	More than -1V	Defective A7Q1, A7R14 or A2R75
			Less than -1V	Proceed to step 11
11		Measure voltage from A7J2-17 to chassis	More than -½V	Bias supply shorted due to defective A7CR5, defective oscillator, short in wiring
			Less than -½V	Proceed to step 12
12		Measure voltage from A7J2-11 to chassis	More than -1V	Defective A2Q8 or associated component
			From -½ to -1V	Defective A2Q7
			From -½ to +1V	Proceed to step 13

6-4. CONT'D

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
13	Low output (cont'd)	Measure voltage from A2IC1-5 to A2IC1-4 (return)	Pin 5 more than -0.1V	Defective IC1
			Pin 5 more than +0.1V	Defective A2C11, A2R55 or A2R56
			Pin 5 and 4 within ±0.1V	Defective A2CR32, A2CR33 or A2IC1

TABLE 6-5

TROUBLE SHOOTING THE BIAS SUPPLY

6-5. NEGATIVE BIAS SUPPLY

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
1	High output	Measure +15V Reference voltage	High voltage	Defective reference supply
			Normal voltage	Proceed to step 2
2		Measure voltage from A5Q5* base to emitter	More than +½V	Proceed to step 3
3		Measure voltage from A3Q7* base to chassis	Less than +1V	Defective A3Q7
			More than +1V	Proceed to step 4
4		Measure voltage from A2IC1-5 to A2IC1-4 (return)	Pin 5 more than +0.1V	A2IC1 defective
			Pin 5 more than -0.1V	Defective A2R55 or A2R56
			Pins 4 and 5 within ±0.1V	Shorted CR32 or 33 or defective IC1
5	Low output	Localize cause	Between ½ and 1V	Proceed to step 6
			Otherwise	Proceed to step 9
6		Feel A2CR20	Cold	Proceed to step 9
			Warm	Protective crowbar circuit conducting. Proceed to step 7
7		Turn primary power off, then on again. Recheck bias supply voltage	Normal (refer to oscillator data sheet in front of manual for normal bias supply voltage)	Crowbar was energized by a transient or an intermittent failure
			Between ½ and 1V	Disconnect oscillator from A7TB2. Proceed to step 8.

*Located in 230A SWEEP OSCILLATOR mainframe

6-5. CONT'D

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
8	Low output (cont'd)	Turn power off Remove A2R68. Turn power on	Bias supply voltage from ½ to 1 Volt	Defective A2Q9 or A2CR20
			Bias supply voltage higher than normal	Proceed to step 1. After repairing failure, reinstall A2R68, verify normal bias voltage and reconnect RF oscillator to A7TB2
9		Measure +15V Reference voltage	Low voltage	Defective reference supply
			Normal voltage	Proceed to step 10
		Measure voltage from A5Q5* collector to chassis	Less than +1½V	Defective A7F1 or A5CR1*, low or no unregulated input to bias supply
			More than required bias supply	Proceed to step 10
10		Measure voltage from A5Q5* base to chassis	More than +1V	Defective A5Q5*, A5R2* or A3R22*
			Less than +1V	Proceed to step 11
11		Measure voltage from A5J4-23* to chassis	More than +½V	Bias supply shorted due to defective A7CR5, defective oscillator, short in wiring
			Less than +½V	Proceed to step 12
12		Measure voltage from A5J4-19* to chassis	More than +1V	Defective A3Q7* or associated component
			From +½ to +1V	Defective A3Q7*
			From +½ to -1V	Proceed to step 13

*) Located in 230A SWEEP OSCILLATOR mainframe

6-5. CONT'D

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
13	Low output (cont'd)	Measure voltage from A2IC1-5 to A2IC1-4 (return)	Pin 5 more than +0.1V	Defective IC1
			Pin 5 more than -0.1V	Defective A2C11, A2R55 or A2R56
			Pin 5 and 4 within +0.1V	Defective A2R32, A2CR33 or A2IC1

TABLE 6-6

TROUBLESHOOTING THE YIG SUPPLY

6-6.

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
1	Sluggish response (low band-width)	Check control settings	Sweep function selector in CW	Inappropriate setting
			Sweep response time switch in slow	
2		Measure voltage from A7J2-1 to chassis	Less than -10V	Short or leakage to ground defective A8S6*
			If it measures -15V	Shorted relay contacts A2K1B
3	Low or no output current	Measure voltage from A7Q2 collector to A7TB2	No voltage or less than 20VDC	Defective A3F1. A3 assembly not installed. Defective unregulated input to YIG supply from mainframe
			At least 25VDC	Proceed to step 4
4		Measure voltage from A7J2-7 to chassis	At least +5V	Defective A7Q2 or associated component
			Less than +1V	Proceed to step 5
5		Measure voltage from A2Q1 base to chassis	More than +1V	Defective A7Q2 or associated component
			Less than +½V	Shorted A2CR25
			At least -½V	Proceed to step 6
6		Measure voltage across A2R38	More than ½V	Defective A2Q3 or associated component
			Less than ½V	Proceed to step 7

*) Located in 230A SWEEP OSCILLATOR mainframe

6-6. CONT'D

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
7	Low or no output current (cont'd)	Measure voltage from A2Q6A base to A2J2-8 (return)	More than +½V	Defective A2Q4, A2Q5 or A2Q6 or associated component
			Less than +½V or negative	Defective A2CR23, A2CR24, A2R34, A2R54, A7R1, A2R12, A2R53 or A2R49. Absence of required signal - Proceed to step 8
8		Measure voltage from A7J2-20 to chassis	Absent	Defective connection
			If it measures +15V	Proceed to step 9
9		Measure voltage from A7J2-3 to A7J2-8	0 to +10V	Normal
			Absent	Defective connection, mainframe waveform generator or associated component
10	High output	Measure voltage from A7J2-7 to chassis	Less than +1V	Defective A7Q2
			At least +1V	Proceed to step 11
11		Measure voltage from A7J2-4 to chassis	Less than -4V	Defective A7R1 or connection
			More than -4V	Proceed to step 12
12		Measure voltage from A2Q1 base to chassis	Less than +1V	Defective A2Q1
			More than +1V	Proceed to step 13
13		Measure voltage across A2R38	Less than ½V	Defective A2Q3
			More than ½V	Proceed to step 14
14		Measure voltage from A2Q6A base to A7J2-8 (return)	More than -½V	Defective A2Q4, A2Q5 or A2Q6 or associated component
			Less than -½V or positive	Defective A2CR23 or A2CR24 or A2R12, A2R34, A2R49, A2R51, A2R53 or A2R54

TABLE 6-7

TROUBLESHOOTING THE VARACTOR SUPPLY

6-7.

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
1	Sluggish response (low band-width)	Check control settings	Sweep function selector in CW	Inappropriate setting
			Sweep response time switch in slow	
2		Measure voltage across relay coil A2K1A	15 V	Defective A8S6* leakage or short in K1A circuit
			Voltage absent	Shorted relay contacts A2K1B
3	High output voltage	Measure voltage from A2Q3 collector to chassis	Less than the varactor supply output voltage (by more than 1V)	Defective A2Q1 or A2Q2
			Within 1 Volt of the output	Proceed to step 4
4		Measure voltage across A2R38	About 3/4 Volt or more	Defective A2Q3
			Less than $\frac{1}{2}$V	Proceed to step 5
5		Measure voltage from A2Q6B base to the opposite side of A2CR23, A2CR24 (return)	More than -$\frac{1}{2}$V	Defective A2Q4, A2Q5, A2Q6 or associated component
			Less than -$\frac{1}{2}$V or positive	Defective A2CR23, A2CR24, A2R22, A2R33, A2R34, A2R51, A2R53, A2R54
6	Low output voltage	Measure voltage from A2CR13	Absent or low	Defective A5Q2* or A5Q3* or associated component defective unregulated 200V supply
			About 200V	Proceed to step 7

*) Located in 230A SWEEP OSCILLATOR mainframe

6-7

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
7	Low output voltage (cont'd)	Measure voltage across A2CR13	Absent or low	Defective A2CR13
			A few volts greater than the required maximum varactor supply voltage	Proceed to step 8
8		Measure the voltage from collector to chassis	More negative than the varactor supply output (by at least 1V)	Defective A2Q1 or A2Q2 or associated component
			Within 1 Volt of the output	Proceed to step 9
9		Measure voltage across A2R38	Less than ½ V	Defective A2Q3 or associated component
			About 3/4 V	Proceed to step 10
10		Measure voltage from A2Q6B base to the opposite side of A2CR23, A2CR24 (return)	More than +½V	Defective A2Q4, A2Q5 or A2Q6 or associated component
			Less than +½V or positive	Defective A2CR23, A2CR24 or A2R22, A2R33, A2R34, A2R51, A2R53 or A2R54

TABLE 6-7

TROUBLESHOOTING THE VARACTOR SUPPLY

6-7.

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
1	Sluggish response (low band-width)	Check control settings	Sweep function selector in CW	Inappropriate setting
			Sweep response time switch in slow	
2		Measure voltage across relay coil A2K1A	15 V	Defective A8S6* leakage or short in K1A circuit
			Voltage absent	Shorted relay contacts A2K1B
3	High output voltage	Measure voltage from A2Q3 collector to chassis	Less than the varactor supply output voltage (by more than 1V)	Defective A2Q1 or A2Q2
			Within 1 Volt of the output	Proceed to step 4
4		Measure voltage across A2R38	About 3/4 Volt or more	Defective A2Q3
			Less than ½V	Proceed to step 5
5		Measure voltage from A2Q6B base to the opposite side of A2CR23, A2CR24 (return)	More than -½V	Defective A2Q4, A2Q5, A2Q6 or associated component
			Less than -½V or positive	Defective A2CR23, A2CR24, A2R22, A2R33, A2R34, A2R51, A2R53, A2R54
6	Low output voltage	Measure voltage from A2CR13	Absent or low	Defective A5Q2* or A5Q3* or associated component defective unregulated 200V supply
			About 200V	Proceed to step 7

*) Located in 230A SWEEP OSCILLATOR mainframe

TABLE 6-8

TROUBLESHOOTING THE LEVELER

6-8.

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
1	No RF output	Measure output voltage of Leveler applied to diode Modulator. Rotate RF level control knob from maximum to minimum	Voltage changes at least 1½V, with polarity reversed	Defective diode modulator or connection
			Voltage changes only slightly	Alignment required or proceed to step 2
2		Measure bias voltage and tuning voltage (or current) of RF oscillator	Absent or abnormal values	Defective bias or tuning supply. Proceed to Table
			Normal values	Proceed to step 3
3		Measure voltage from A7S2D to chassis	More than -1V	Inappropriate mainframe control settings, defective mainframe A2 assembly or associate circuit
			Less than ±1V	Proceed to step 4
4	No RF output	Rotate RF level control maximum clockwise. Measure voltage from A1IC2-10 to chassis	At least -1V	Defective transistor or associated component in current amplifier section
			Less than -1V or positive	Proceed to step 6
5		Measure voltage from A1IC2-4 to A1IC2-5 (return)	More than +½V	Defective A2IC2
			Less than ±½V	Defective diode or other associated component in IC2 and RF level control circuit
6	Maximum RF output RF level control ineffective	Measure output voltage of leveler applied to diode modulator. Rotate RF level control knob from maximum to minimum	Voltage change of at least 1½V, with polarity reversed	Defective diode modulator or connection

6-8. CONT'D

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
6	Maximum RF output. RF Level control ineffective (cont'd)	Measure output voltage of leveler applied to diode modulator. Rotate RF level control knob from maximum to minimum (cont'd)	Voltage changes only slightly	Alignment required or proceed to step 7
7		Rotate RF level control maximum counter clockwise measure voltage from A1IC2-10 to chassis	At least 1V	Defective transistor or associated component in current amplifier section
			Less than +1V or negative	Defective A1IC2 or associated component
8	RF output unleveled and changes abruptly when RF level control rotated, in leveled mode	-	-	Defective directional detector or connection

SECTION 7-0

REPLACEABLE PARTS

7-1. INTRODUCTION. This section provides information for procuring replaceable parts for the Model 230A. Table 7-2 provides an alpha-numerical list, by reference designation, of all parts. The following information is given, when applicable, for each part listed:

a. Micro-Power part number
b. Description of part.
c. Typical manufacturer and manufacturer's part number.

7-2. REFERENCE DESIGNATIONS AND ABBREVIATIONS. See Table 7-1 for a complete explanation of reference designations and abbreviations.

7-3. ORDERING INFORMATION. The following information should be included on purchase order when ordering replacement parts from the Micro-Power Corporation:

a. The Micro-Power part number and part description.
b. The instrument's model number and serial number.
c. If ordering a part not included in Table 7-4, include a complete description of the part, its function and its location within the equipment.

The following information should be included on purchase order when ordering replacement parts from another manufacturer:

The complete description of the part and manufacturer's part number for the part as they appear in Table 7-4.

TABLE 7-1

ABBREVIATIONS AND REFERENCE DESIGNATIONS

All reference designations for electrical parts will be preceded by a prefix which will indicate the assembly in which it is contained. These prefixes will be identified as follows:

A1 - LEVELER
A2 - TUNING AND BIAS SUPPLIES
A3 - FM AMPLIFIER
A4 - RF ASSEMBLY
A5 - SYMMETRICAL SWEEP SWITCH
A6 - LEVELER SWITCH
*A7 - MAIN ASSEMBLY

* Includes all parts within mainframe not included in Assembly A1-A6.

ABBREVIATIONS

A-Amperes
AMPL-Amplifier
AM-Amplitude modulation
APPROX-Approximate
ASS'Y-Assembly
AUX-Auxiliary
AVG-Average
BAL-Balance
BWO-Backward wave oscillator
C-Cathode
CAL-Calibrator
CCW-Counterclockwise
CW-Clockwise
dB-Decibel
dBm-Decibel (referred to 1 milliwatt in 600 ohms)
EXT-External
F-Farad
FIG-Figure
FIX-Fixed
FM-Frequency modulate
A-Assembly
B-Motor
C-Capacitor
CR-Diode
DS-Lamp
F-Fuse
FWD-Forward
G-Giga=10^{9}
GRD-Ground
H-Henry
Hz-Cycle per second
IDENT-Identification
IMP-Impulse
INT-Internal
K-Kilo=10^{3}
LIN-Linear
M-Milli=10^{-3}
MAX-Maximum
MEG-Meg=10^{6}
MFG-Manufacturer
MIN-Minimum
N-Nano=10^{-9}
NC-Normally closed
NEG-Negative
NO-Normally open
Ω -Ohm
O -Peak
J -Jack
K -Relay
L -Inductor
M -Meter
P -Plug
Q -Transistor
PC-Printed Circuit
PF-Pico farads=10^{-12} farads
P/O-Part of
POT-Potentiometer
P-P-Peak to Peak
RECT-Rectifier
RES-Resistance or Resistor
RET-Return
REV-Reverse
RF-Radio Frequency
RMS-Square root of mean square
SEC-Second
SW-Switch
SYM-Symmetrical
TRIG-Trigger
TYP-Typical
U-Micro=10^{-6}
V-Volt
VAR-Variable
W-Watts
R-Resistor
S-Switch
T-Transformer
TB-Terminal board
TP-Test point
V-Vacuum
X-Socket

TABLE 7-2

ASSEMBLY/MODEL CROSS REFERENCE

MODEL	RF OSCILLATOR A4A1	LEVELER A1	TUNING & BIAS POWER SUPPLY A2	FM AMPLIFIER A3	RF ASSEMBLY A4	SYM SWP SW ASSY A5	LEVELER SW ASSY A6	MAIN ASSEMBLY A7
231A	571-004*	207-072	207-081	NOT USED	250-027	250-008	250-012	250-007
232A	571-012	207-072	207-079	207-135	250-028	250-011	250-012	250-007
242A	571-011	207-072	207-136	207-135	250-028	250-043	250-012	250-007
234A(WJ)	571-007	207-072	207-151	207-152	250-030	250-051	250-012	250-007
234A(VA)	571-013	207-072	207-153	207-152	250-056	250-051	250-012	250-007
238A	571-005	207-137	207-081	NOT USED	250-053	250-032	250-046	250-054
238B	571-005	207-137	207-081	NOT USED	250-031	250-032	250-046	250-036

*) See specific parts list.

TABLE 7-3

SPECIFIC COMPONENT/MODEL CROSS REFERENCE

MODEL	A7F1	A7Q1*	A7Q2*	A7R5	A7R6	A7R7	A7R13	A7R14	A7C1
231A	1 Amp 212-005	USED	NOT USED	NOT USED	NOT USED	44.2K Ohm 315-076	10 Ohm 300-100	.68 Ohm 306-003	NOT USED
232A	.25 Amp 212-008	USED	USED	10 Ohm 300-100	22 Ohm 303-220	69.8K Ohm 315-037	10 Ohm 300-100	.68 Ohm 306-003	100 pf 460-101
242A	.25 Amp 212-008	USED	USED	10 Ohm 300-100	22 Ohm 303-220	69.8K Ohm 315-037	10 Ohm 300-100	.68 Ohm 306-003	100 pf 460-101
234A(MJ)	1.5 Amp 212-007	USED	USED	10 Ohm 300-100	5.55 Ohm 305-018	49.9K Ohm 315-020	NOT USED	NOT USED	100 pf 460-101
234A(VA)	1.0 Amp 212-005	NOT USED	USED	10 Ohm 300-100	5.55 Ohm 305-018	49.9K Ohm 315-020	10 Ohm 300-100	1.73 Ohm 305-015	100 pf 460-101
238A	1.0 Amp 212-005	USED	NOT USED	NOT USED	NOT USED	44.2K Ohm 315-076	10 Ohm 300-100	.68 Ohm 306-003	NOT USED
238B	1.0 Amp 212-005	USED	NOT USED	NOT USED	NOT USED	44.2K Ohm 315-076	10 Ohm 300-100	.68 Ohm 306-003	NOT USED

*) See specific parts list

TABLE 7-4-1

SCALE PART NUMBER

MODEL	FREQUENCY	PART NUMBER
231A	1-2 GHz	209-041
232A	2-4 GHz	209-042
233A	4-8 GHz	209-043
234A	8-12.4 GHz	209-044
234A	12.4-18 GHz	209-046
236A	18-26 GHz	209-056
237A	26-40 GHz	209-057
238A	0.1-2 GHz	209-045
239A	100-1000 MHz	209-058
240A	1-100 MHz	209-059
241A	1.4-2.5 GHz	209-060
242A	1.7-4.2 GHz	209-049
243A	3.6-4.3 GHz	209-061
244A	5.85-6.45 GHz	209-062

TABLE 7-4

REPLACEABLE PARTS
LEVELER, TYPE A
207-072

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A1	207-072	Leveler, Type A		
A1C1	430-019	4700 pf 10% 50V Mylar	84411	601PE
A1C2	460-221	220 pf 10% 500V Mica	84171	DM15
A1C3	450-471	470 pf 10% 500V Mica	84171	DM15
A1C4	460-220	22 pf 10% 500V Mica	84171	DM15
A1C5	460-681	680 pf 10% 500V Mica	84171	DM15
A1C6	440-040	10 uf 20% 20V Tant	56289	150D106X0020B2
A1C7	400-044	100 uf -10+100% 12V Elect	56289	30D107G012CC2
A1C8		Not Used		
A1C9	430-032	0.22 uf 10% 50V Mylar	84411	601PE
A1CR1	500-010	Diode		IN914
A1CR2	500-010	Diode		IN914
A1CR3	500-010	Diode		IN914
A1CR4	500-010	Diode		IN914
A1CR5	500-010	Diode		IN914
A1CR5	500-010	Diode		IN914
A1CR6	500-010	Diode		IN914
A1CR7	500-010	Diode		IN914
A1CR8	500-010	Diode		IN914
A1CR9	500-010	Diode		IN914
A1IC1	503-001	I.C. Amplifier	01295	SN72709N
A1IC2	503-001	I.C. Amplifier	01295	SN72709N
A1Q1	502-010	Transistor		2N3707
A1Q2	502-024	Transistor		2N5184
A1Q3	502-010	Transistor		2N3707
A1Q4		Not Used		
A1Q5	502-005	Transistor		2N697
A1R1	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A1R2	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A1R3	300-332	3300 ohm 10% 1/4W Comp		RC07GF332K
A1R4	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A1R5	300-152	1500 ohm 10% 1/4W Comp		RC07GF152K
A1R6	300-103	10K ohm 10% 1/4W Comp		RC07GF103K
A1R7	300-472	4700 ohm 10% 1/4W Comp		RC07GF472K
A1R8	300-103	10K ohm 10% 1/4W Comp		RC07GF103K
A1R9	300-153	15K ohm 10% 1/4W Comp		RC07GF153K
A1R10	300-222	2200 ohm 10% 1/4W Comp		RC07GF222K

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
LEVELER 207-072

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION				CODE IDENT	MFG PART NO.
A1R11	300-221	220 ohm	10%	1/4W	Comp		RC07GF221K
A1R12	304-006	10K ohm	10%	1/2W	W.W. Lin Var	91637	2387
A1R13	300-102	1000 ohm	10%	1/4W	Comp		RC07GF102K
A1R14	300-473	47K ohm	10%	1/4W	Comp		RC07GF473K
A1R15	300-223	22K ohm	10%	1/4W	Comp		RC07GF223K
A1R16	315-039	2150 ohm	1%	1/8W	Met Film		RN60D2151F
A1R17	300-152	1500 ohm	10%	1/4W	Comp		RC07GF152K
A1R18	300-333	33K ohm	10%	1/4W	Comp		RC07GF333K
A1R19	300-152	1500 ohm	10%	1/4W	Comp		RC07GF152K
A1R20	300-333	33K ohm	10%	1/4W	Comp		RC07GF333K
A1R21	300-103	10K ohm	10%	1/4W	Comp		RC07GF103K
A1R22	300-682	6800 ohm	10%	1/4W	Comp		RC07GF682K
A1R23	300-221	220 ohm	10%	1/4W	Comp		RC07GF221K
A1R24	300-333	33K ohm	10%	1/4W	Comp		RC07GF333K
A1R25	300-474	470K ohm	10%	1/4W	Comp		RC07GF474K
A1R26	305-058	332 ohm	1%	3W	W.W.		RW79U3320F
A1R27	315-038	4320 ohm	1%	1/8W	Met Film		RN60D4321F
A1R28	315-038	4320 ohm	1%	1/8W	Met Film		RN60D4321F
A1R29	300-682	6800 ohm	10%	1/4W	Comp		RC07GF682K
A1R30	300-472	4700 ohm	10%	1/4W	Comp		RC07GF472K
A1R31	315-040	1270 ohm	1%	1/8W	Met Film		RN60D1271F
A1R32	300-103	10K ohm	10%	1/4W	Comp		RC07GF103K
A1R33	300-682	6800 ohm	10%	1/4W	Comp		RC07GF682K
A1R34		Not Used					
A1R35		Not Used					
A1R36		Not Used					
A1R37		Not Used					
A1R38	303-101	100 ohm	10%	2W	Comp		RC42GF101K
A1R39	300-330	33 ohm	10%	1/4W	Comp		RC07GF330K
A1R40		Not Assigned					
A1R41	300-152	1500 ohm	10%	1/4W	Comp		RC07GF152K
A1R42	300-333	33K ohm	10%	1/4W	Comp		RC07GF333K

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
LEVELER, TYPE B
207-137

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A1	207-137	Leveler, Type B		
A1C1	430-019	4700 pf 10% 50V Mylar	84411	601PE
A1C2	460-221	220 pf 10% 500V Mica	84171	DM15
A1C3	460-101	100 pf 10% 500V Mica	84171	DM15
A1C4	415-005	3300 pf 5% 1KV FixedComp	82141	Type JM
A1C5	440-041	1.0 uf 20% 20V Tant	56289	150D105X0020A2
A1C6	440-041	1.0 uf 20% 20V Tant	56289	150D105X0020A2
A1C7	460-101	100 pf 10% 500V Mica	84171	DM15
A1C8	430-027	0.01 uf 10% 50V Mylar	84411	601PE
A1C9	430-027	0.01 uf 10% 50V Mylar	84411	601PE
A1C10	430-019	4700 pf 10% 50V Mylar	84411	601PE
A1C11	430-019	4700 pf 10% 50V Mylar	84411	601PE
A1C12	460-101	100 pf 10% 500V Mica	84171	DM15
A1C13	460-221	220 pf 10% 500V Mica	84171	DM15
A1CR1	500-010	Diode		IN914
A1CR2	500-010	Diode		IN914
A1CR3	500-010	Diode		IN914
A1CR4	500-010	Diode		IN914
A1CR5		Not Used		
A1CR6	500-010	Diode		IN914
A1CR7	500-010	Diode		IN914
A1CR8	501-013	Diode, Zener		IN749A
A1CR9	500-010	Diode		IN914
A1CR10	500-010	Diode		IN914
A1CR11	501-007	Diode, Zener		IN753A
A1CR12		Not Used		
A1CR13	500-010	Diode		IN914
A1IC1	503-001	I.C. Amplifier	01295	SN72709N
A1IC2	503-001	I.C. Amplifier	01295	SN72709N
A1Q1	502-010	Transistor		2N3707
A1Q2		Not Used		
A1Q3	502-010	Transistor		2N3707
A1Q4	502-026	Transistor		2N2905A
A1Q5	502-026	Transistor		2N2905A
A1Q6	502-010	Transistor		2N3707
A1Q7	502-005	Transistor		2N697
A1Q8	502-026	Transistor		2N2905A
A1Q9	502-024	Transistor		2N5184

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
LEVELER, TYPE B
207-137

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A1R1	300-222	2200 ohm 10% 1/4W Comp		RC07GF222K
A1R2	300-152	1500 ohm 10% 1/4W Comp		RC07GF152K
A1R3	300-470	47 ohm 10% 1/4W Comp		RC07GF470K
A1R4	300-222	2200 ohm 10% 1/4W Comp		RC07GF222K
A1R5		Selected at Test		
A1R6	315-061	10K ohm 1% 1/8W Met Film		RN60D1002F
A1R7	300-223	22K ohm 10% 1/4W Comp		RC07GF223K
A1R8	300-153	15K ohm 10% 1/4W Comp		RC07GF153K
A1R9	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A1R10	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A1R11	300-683	68K ohm 10% 1/4W Comp		RC07GF683K
A1R12		Selected at Test		
A1R13	315-111	5110 ohm 1% 1/8W Met Film		RN60D5111F
A1R14	300-333	33K ohm 10% 1/4W Comp		RC07GF333K
A1R15	315-111	5110 ohm 1% 1/8W Met Film		RN60D5111F
A1R16	300-152	1500 ohm 10% 1/4W Comp		RC07GF152K
A1R17	300-470	47 ohm 10% 1/4W Comp		RC07GF470K
A1R18	300-474	470 ohm 10% 1/4W Comp		RC07GF474K
A1R19	315-088	15K ohm 1% 1/8W Met Film		RN60D1502F
A1R20	304-005	1000 ohm 10% 1/2W WW LinVar	91637	2387
A1R21	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A1R22	300-474	470K ohm 10% 1/4W Comp		RC07GF474K
A1R23	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A1R24	300-474	470K ohm 10% 1/4W Comp		RC07GF474K
A1R25		Not Used		
A1R26		Not Used		
A1R27	300-472	4700 ohm 10% 1/4W Comp		RC07GF472K
A1R28	300-472	4700 ohm 10% 1/4W Comp		RC07GF472K
A1R29	304-005	1000 ohm 10% 1/2W WW LinVar	91637	2387
A1R30	300-104	100K ohm 10% 1/4W Comp		RC07GF104K
A1R31	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A1R32	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A1R33	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A1R34	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A1R35	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A1R36	300-103	10K ohm 10% 1/4W Comp		RC07GF103K
A1R37		Selected at Test		
A1R38	302-102	1000 ohm 10% 1W Comp		RC32GF102K
A1R39	300-682	6800 ohm 10% 1/4W Comp		RC07GF682K
A1R40	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A1R41	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A1R42	300-472	4700 ohm 10% 1/4W Comp		RC07GF472K
A1R43	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A1R44	300-100	10 ohm 10% 1/4W Comp		RC07GF100K
A1R45	300-100	10 ohm 10% 1/4W Comp		RC07GF100K

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
LEVELER, TYPE B
207-137

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A1R46		Selected at Test		
A1R47	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A1R48	300-473	47K ohm 10% 1/4W Comp		RC07GF473K
A1R49	300-474	470K ohm 10% 1/4W Comp		RC07GF474K
A1R50	300-104	100K ohm 10% 1/4W Comp		RC07GF104K
A1R51	315-061	10K ohm 1% 1/8W Met Film		RN60D1002F
A1R52	315-055	2490 ohm 1% 1/8W Met Film		RN60D2491F
A1R53	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A1R54	315-088	15K ohm 1% 1/8W Met Film		RN60D1502F
A1R55	300-470	47 ohm 10% 1/4W Comp		RC07GF470K
A1R56	315-081	3010 ohm 1% 1/8W Met Film		RN60D3011F
A1R57	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A1R58	300-332	3300 ohm 10% 1/4W Comp		RC07GF332K
	233-007	Transistor Pad	07047	A-10029
	233-011	I.C. Socket	91506	314-AG50-2
	201-032	Eyelet, Tunnel FL, Copper	57771	A2130

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
TUNING AND BIAS SUPPLY
207-079
207-136

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2	207-079	Tuning & Bias Supply (Model 232A)		
A2	207-136	Tuning & Bias Supply (Model 242A)		
A2C1	440-040	10 uf 20% 20V Tant	56289	1500106 x 0020B2
A2C2	430-011	0.1 uf 10% 50V Mylar	84411	601PE
A2C3	430-011	0.1 uf 10% 50V Mylar	84411	601PE
A2C4		Not Used		
A2C5	430-013	.0033 uf 10% 600V Mylar	56289	6PS-D33
A2C6	430-027	0.01 uf 10% 50V Mylar	84411	601PE
A2C7		Not Used		
A2C8	430-027	0.01 uf 10% 50V Mylar	84411	601PE
A2C9	430-011	0.1 uf 10% 50V Mylar	84411	601PE
A2C10		Not Used		
A2C11	430-032	0.22 uf 10% 50V Mylar	84411	601PE
A2C12	430-017	0.047 uf 10% 50V Mylar	84411	601PE
A2C13	420-035	.002 uf 20% 1KV Cer	56289	5GA-D20
A2C14	400-043	10 uf -10+100% 25V Elect	56289	TE1204
A2C15	400-041	100 uf -10+100% 25V Elect	56289	TE1211
A2CR1		Not Used		
A2CR2		Not Used		
A2CR3		Not Used		
A2CR4		Not Used		
A2CR5		Not Used		
A2CR6		Not Used		
A2CR7		Not Used		
A2CR8		Not Used		
A2CR9		Not Used		
A2CR10		Not Used		
A2CR11		Not Used		
A2CR12		Not Used		
A2CR13		Not Used		
A2CR14		Not Used		
A2CR15		Not Used		
A2CR16	500-010	Diode		IN914
A2CR17	500-010	Diode		IN914
A2CR18	501-013	Diode, Zener		IN749A
A2CR19		Not Used		
A2CR20	500-019	SCR		2N4441
A2CR21		Not Used		
A2CR22		Not Used		
A2CR23	500-010	Diode		IN914
A2CR24	500-010	Diode		IN914

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
TUNING AND BIAS SUPPLY
207-079
207-136

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2CR25	500-010	Diode		IN914
A2CR26	500-013	Diode		IN277
A2CR27	501-013	Diode, Zener		IN749A
A2CR28	500-010	Diode		IN914
A2CR29	500-010	Diode		IN914
A2CR30	500-010	Diode		IN914
A2CR31		Not Used		
A2CR32	500-010	Diode		IN914
A2CR33	500-010	Diode		IN914
A2CR34	500-010	Diode		IN914
A2IC1	503-001	I.C. Amplifier	01295	SN72709N
A2K1A	216-002	Relay Coil	18786	
A2K1B	211-014	Reed	95348	20-50A-T (MR107)
A2Q1	502-024	Transistor		2N5184
A2Q2		Not Used		
A2Q3	502-026	Transistor		2N2905A
A2Q4	502-010	Transistor		2N3707
A2Q5	505-010	Transistor		2N3707
A2Q6	502-031	Transistor		2N4045
A2Q7	502-013	Transistor		2N3703
A2Q8	502-013	Transistor		2N3703
A2Q9	502-026	Transistor		2N2905A
A2R1		Not Used		
A2R2		Not Used		
A2R3		Not Used		
A2R4		Not Used		
A2R5		Not Used		
A2R6		Not Used		
A2R7		Not Used		
A2R8		Not Used		
A2R9		Not Used		
A2R10		Not Used		
A2R11		Not Used		
A2R12	304-005	1000 ohm 10% 1/2W WW Lin Var	91637	2387

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
TUNING AND BIAS SUPPLY
207-079
207-136

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2R13		Not Used		
A2R14		Not Used		
A2R15		Not Used		
A2R16		Not Used		
A2R17		Not Used		
A2R18		Not Used		
A2R19		Not Used		
A2R20		Not Used		
A2R21		Not Used		
A2R22		Not Used		
A2R23		Not Used		
A2R24		Not Used		
A2R25		Not Used		
A2R26		Not Used		
A2R27		Not Used		
A2R28		Not Used		
A2R29		Not Used		
A2R30		Not Used		
A2R31		Not Used		
A2R32		Not Used		
A2R33		Not Used		
A2R34		Model 232A		
	315-036	16.9K ohm 1% 1/8W Met Film		RN60D1692F
A2R34		Model 242A		
	315-085	21K ohm 1% 1/8W Met Film		RN60D2102F
A2R35	315-095	1.0 Meg ohm 1% 1/8W Met Film		RN60D1004F
A2R36	315-095	1.0 Meg ohm 1% 1/8W Met Film		RN60D1004F
A2R37	300-103	10K ohm 10% 1/4W Comp		RC07GF103K
A2R38	300-103	10K ohm 10% 1/4W Comp		RC07GF103K
A2R39	300-470	47 ohm 10% 1/4W Comp		RC07GF470K
A2R40	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A2R41	300-473	47K ohm 10% 1/4W Comp		RC07GF473K
A2R42	300-101	100 ohm 10% 1/4W Comp		RG07GF101K
A2R43	315-019	100K ohm 1% 1/8W Met Film		RN60D1003F
A2R44	300-470	47 ohm 10% 1/4W Comp		RC07GF470K
A2R45	300-332	3300 ohm 10% 1/4W Comp		RC07GF332K
A2R46	315-124	750K ohm 1% 1/8W Met Film		RN60D7503F
A2R47	300-103	10K ohm 10% 1/4W Comp		RC07GF103K
A2R48	300-100	10 ohm 10% 1/4W Comp		RC07GF100K
A2R49		Model 232A		
	315-078	5900 ohm 1% 1/8W Met Film		RN60D5901F
A2R49		Model 242A		
	315-098	7500 ohm 1% 1/8W Met Film		RN60D7501F
A2R50		Not Used		

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
TUNING AND BIAS SUPPLY
207-079
207-136

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2R51	315-061	10K ohm 1% 1/8W Met Film		RN60D1002F
A2R52		Not Used		
A2R53	315-061	10K ohm 1% 1/8W Met Film		RN60D1002F
A2R54		Model 232A		
	304-005	1000 ohm 10% 1/2W WW LinVar	91637	2387
A2R54		Model 242A		
	304-006	10K ohm 10% 1/2W WW LinVar	91637	2387
A2R55	325-046	20K ohm .05% 1/8W WW	91637	MWA-10
A2R56	325-004	15K ohm .05% 1/8W WW	91637	MWA-10
A2R57		Not Used		
A2R58		Not Used		
A2R59		Not Used		
A2R60		Not Used		
A2R61		Not Used		
A2R62	300-152	1500 ohm 10% 1/4W Comp		RC07GF152K
A2R63	300-221	220 ohm 10% 1/4W Comp		RC07GF221K
A2R64	300-472	4700 ohm 10% 1/4W Comp		RC07GF472K
A2R65	300-682	6800 ohm 10% 1/4W Comp		RC07GF682K
A2R66	301-681	680 ohm 10% 1/2W Comp		RC20GF681K
A2R67	315-049	1910 ohm 1% 1/8W Met Film		RN60D1911F
A2R68	315-	To be determined		RN60D
A2R69	300-471	470 ohm 10% 1/4W Comp		RC07GF471K
A2R70	315-057	8060 ohm 1% 1/8W Met Film		RN60D8061F
A2R71	315-061	10K ohm 1% 1/8W Met Film		RN60D1002F
A2R72	300-471	470 ohm 10% 1/4W Comp		RC07GF471K
A2R73		Not Used		
A2R74		Not Used		
A2R75	305-043	3.56 ohm 1% 3W WW		RW79U3R56F
A2R76	300-027	2.7 ohm 10% 1/4W Comp		RC07GF2R7K
A2R77	300-104	100K ohm 10% 1/4W Comp		RC07GF104K
A2R78	300-101	100 ohm 10% 1/4W Comp		RC07GF101K

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS.
TUNING AND BIAS SUPPLY
207-081

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2	207-081	Tuning & Bias Supply		
A2C1	430-026	0.22 uf 10% 200V Mylar	84411	X663F
A2C2	430-011	0.1 uf 10% 50V Mylar	84411	601PE
A2C3	430-011	0.1 uf 10% 50V Mylar	84411	601PE
A2C4		Not Used		
A2C5	460-151	150 pf 10% 500V Mica	84171	DM-15
A2C6	430-027	0.01 uf 10% 50V Mylar	84411	601PE
A2C7		Not Used		
A2C8	430-024	0.022 uf 10% 50V Mylar	84411	601PE
A2C9	430-011	0.1 uf 10% 50V Mylar	84411	601PE
A2C10	460-680	68 pf 10% 500V Mica	84171	DM-15
A2C11	430-032	0.22 uf 10% 50V Mylar	84411	601PE
A2C12	430-011	0.1 uf 10% 50V Mylar	84411	601PE
A2C13	420-035	0.002 uf 20% 1KV Cer	56289	5GA-D20
A2C14	400-043	10 uf -10+100% 25V Elect	56289	TE1204
A2C15	400-041	100 uf -10+100% 25V Elect	56289	TE1211
A2C16	430-027	0.01 uf 10% 50V Mylar	84411	601PE
A2C17	460-221	220 pf 10% 500V Mica	84171	DM15
A2CR1	500-010	Diode		IN914
A2CR2	500-010	Diode		IN914
A2CR3	500-010	Diode		IN914
A2CR4	500-010	Diode		IN914
A2CR5	500-010	Diode		IN914
A2CR6	500-010	Diode		IN914
A2CR7	500-010	Diode		IN914
A2CR8	500-010	Diode		IN914
A2CR9	500-010	Diode		IN914
A2CR10	500-010	Diode		IN914
A2CR11	500-010	Diode		IN914
A2CR12	500-010	Diode		IN914
A2CR13	501-026	Diode, Zener		IN982B
A2CR14	500-010	Diode		IN914
A2CR15	500-010	Diode		IN914
A2CR16	500-010	Diode		IN914
A2CR17	500-010	Diode		IN914
A2CR18	501-013	Diode, Zener		IN749A
A2CR19	500-010	Diode		IN914
A2CR20	500-019	SCR		2N4441
A2CR21	500-010	Diode		IN914
A2CR22	500-010	Diode		IN914
A2CR23	500-010	Diode		IN914
A2CR24	500-010	Diode		IN914
A2CR25	500-010	Diode		IN914

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
TUNING AND BIAS SUPPLY
207-081

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2CR26	500-013	Diode		IN277
A2CR27	501-013	Diode, Zener		IN749A
A2CR28	500-010	Diode		IN914
A2CR29	500-010	Diode		IN914
A2CR30	500-010	Diode		IN914
A2CR31		Not Used		
A2CR32	500-010	Diode		IN914
A2CR33	500-010	Diode		IN914
A2CR34	500-010	Diode		1N914
A2CR35,36	500-010	Diode		1N914
A2IC1	503-001	I.C. Amplifier	01295	SN72709N
A2K1A	216-002	Relay Coil	18786	
A2K1B	211-014	Reed	95348	MR107 20-50A-T
A2Q1	502-024	Transistor		2N5184
A2Q2	502-032	Transistor	04713	MM4001
A2Q3	502-026	Transistor		2N2905A
A2Q4	502-010	Transistor		2N3707
A2Q5	502-010	Transistor		2N3707
A2Q6	502-031	Transistor		2N4045
A2Q7	502-013	Transistor		2N3703
A2Q8	502-013	Transistor		2N3703
A2Q9	502-026	Transistor		2N2905A
A2R1	305-034	400 ohm 3% 3W WW		RW79U4000F
A2R2	315-088	15K ohm 1% 1/8W Met Film		RN60D1502F
A2R3		Not Used		
A2R4	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R5	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R6	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R7	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R8	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R9	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R10	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R11	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R12	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R13	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R14	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R15	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R16	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R17	315-001	14 ohm 1% 1/8W Met Film		RN60D1400F
A2R18		To be determined by test		
A2R19		To be determined by test		
A2R20		To be determined by test		

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
TUNING AND BIAS SUPPLY
207-081

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION				CODE IDENT	MFG PART NO.
A2R21		To be determined by test					
A2R22		To be determined by test					
A2R23		To be determined by test					
A2R24		To be determined by test					
A2R25		To be determined by test					
A2R26		To be determined by test					
A2R27		To be determined by test					
A2R28		To be determined by test					
A2R29		To be determined by test					
A2R30		To be determined by test					
A2R31		To be determined by test					
A2R32		To be determined by test					
A2R33	315-061	10K ohm	1%	1/8W	Met Film		RN60D1002F
A2R34	315-068	20K ohm	1%	1/8W	Met Film		RN60D2002F
A2R35	315-095	1.0 Meg ohm	1%	1/8W	Met Film		RN60D1004F
A2R36	315-095	1.0 Meg ohm	1%	1/8W	Met Film		RN60D1004F
A2R37	300-103	10K ohm	10%	1/4W	Comp		RC07GF103K
A2R38	300-103	10K ohm	10%	1/4W	Comp		RC07GF103K
A2R39	300-470	47 ohm	10%	1/4W	Comp		RC07GF470K
A2R40	300-101	100 ohm	10%	1/4W	Comp		RC07GF101K
A2R41	300-223	22K ohm	10%	1/4W	Comp		RC07GF223K
A2R42	300-101	100 ohm	10%	1/4W	Comp		RG07GF101K
A2R43	315-019	100K ohm	1%	1/8W	Met Film		RN60D1003F
A2R44	300-101	100 ohm	10%	1/4W	Comp		RC07GF101K
A2R45	300-102	1000 ohm	10%	1/4W	Comp		RC07GF102K
A2R46	315-124	750K ohm	1%	1/8W	Met Film		RN60D7503F
A2R47	302-103	10K ohm	10%	1W	Comp		RC32GF103K
A2R48	300-101	100 ohm	10%	1/4W	Comp		RC07GF101K
A2R49	300-101	100 ohm	10%	1/4W	Comp		RC07GF101K
A2R50	302-333	33K ohm	10%	1W	Comp		RC32GF333K
A2R51	315-020	49.9K ohm	1%	1/8W	Met Film		RN60D4992F
A2R52*	315-094	330K ohm	1%	1/8W	Met Film		RN60D3303F
A2R53	315-020	49.9K ohm	1%	1/8W	Met Film		RN60D4992F
A2R54	304-022	2000 ohm	10%	1/2W	WW LinVar	91637	2387
A2R55	315-079	23.7K ohm	1%	1/8W	WW		RN60D2371F
A2R56	325-004	15K ohm	.05%	1/8W	WW	91637	MWA-10
A2R57	326-511	511 ohm	3%	3W	WW		RW79U5110F
A2R58	315-088	15K ohm	1%	1/8W	Met Film		RN60D1502F
A2R59	315-125	470 ohm	1%	1/8W	Met Film		RN60D4700F
A2R60		Not Used					
A2R61		Not Used					
A2R62	300-152	1500 ohm	10%	1/4W	Comp		RC07GF152K
A2R63	300-221	220 ohm	10%	1/4W	Comp		RC07GF221K
A2R54	300-682	6800 ohm	10%	1/4W	Comp		RC07GF682K
A2R66	300-681	680 ohm	10%	1/4W	Comp		RC07GF681K

*Used on 238A and 238B only

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
TUNING AND BIAS SUPPLY
207-081

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2R67	315-039	2.15K ohm 1% 1/8W Met Film		RN60D2151F
A2R68	315-	To be determined by test		RN60D
A2R69	300-471	470 ohm 10% 1/4W Comp		RC07GF471K
A2R70	315-057	8060 ohm 1% 1/8W Met Film		RN60D8061F
A2R71	315-061	10K ohm 1% 1/8W Met Film		RN60D1002F
A2R72	300-471	470 ohm 10% 1/4W Comp		RC07GF471K
A2R73		Not Used		
A2R74		Not Used		
A2R75	305-017	1.28 ohm 1% 3W WW		RW79U1R28F
A2R76	300-027	2.7 ohm 10% 1/4W Comp		RC07GF2R7K
A2R77	300-101	100 ohm 10% 1/4W Comp		RC07GF101K

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
207-151

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2	207-151	Tuning and Bias Supply		
A2C1	440-013	2.2uf 20% 20V Tant	56289	150D225X9020A2
A2C2	430-011	0.1uf 10% 50V Mylar	84411	601PE
A2C3	430-011	0.1uf 10% 50V Mylar	84411	601PE
A2C4		Not Used		
A2C5	430-013	.0033uf 10% 600V Mylar	56289	6PS-D33
A2C6	430-027	0.01uf 10% 50V Mylar	84411	601PE
A2C7		Not Used		
A2C8	430-027	0.01uf 10% 50V Mylar	84411	601PE
A2C9	430-011	0.1uf 10% 50V Mylar	84411	601PE
A2C10		Not Used		
A2C11	430-032	0.22uf 10% 50V Mylar	84411	601PE
A2C12	430-017	0.047uf 10% 50V Mylar	84411	601PE
A2C13	420-035	0.002uf 20% 1KV Cer	56289	5GA-D20
A2C14	440-042	100uf +20% 20V Tant	56289	150D107X002052
A2C15	400-041	100uf -10+100% 25V Elect	56289	TE1211
A2C16	460-221	220pf 10% 500V Mica	84171	DM15-221
A2C17	430-019	4700pf 10% 50V Mylar	84411	601PE
A2CR1		Not Used		
A2CR2		Not Used		
A2CR3		Not Used		
A2CR4		Not Used		
A2CR5		Not Used		
A2CR6		Not Used		
A2CR7		Not Used		
A2CR8		Not Used		
A2CR9		Not Used		
A2CR10		Not Used		
A2CR11		Not Used		
A2CR12		Not Used		
A2CR13		Not Used		
A2CR14		Not Used		
A2CR15		Not Used		
A2CR16	500-010	Diode		IN914
A2CR17	500-010	Diode		IN914
A2CR18	501-013	Diode, Zener		IN749A
A2CR19		Not Used		
A2CR20	500-019	SCR		2N4441
A2CR21		Not Used		
A2CR22		Not Used		
A2CR23	500-010	Diode		IN914
A2CR24	500-010	Diode		IN914
A2CR25	500-010	Diode		IN914

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
207-151

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2CR26	500-013	Diode		IN277
A2CR27	501-013	Diode, Zener		IN749A
A2CR28	500-010	Diode		IN914
A2CR30		Not Used		
A2CR31		Not Used		
A2CR32	500-010	Diode		IN914
A2CR33	500-010	Diode		IN914
A2CR34	500-010	Diode		IN914
A2CR35	500-010	Diode		IN914
A2CR36	500-010	Diode		IN914
A2CR37	500-010	Diode		IN914
A2IC1	503-001	I.C. Amplifier	01295	SN72709N
A2IC2	503-001	I.C. Amplifier	01295	SN72709N
A2K1A	216-002	Relay Coil	18786	
A2K1B	211-014	Reed	95348	MR107 20-50A-T
A2Q1	502-024	Transistor		2N5184
A2Q2		Not Used		
A2Q3	502-026	Transistor		2N2905A
A2Q4	502-010	Transistor		2N3707
A2Q5	502-010	Transistor		2N3707
A2Q6	502-031	Transistor		2N4045
A2Q7		Not Used		
A2Q8		Not Used		
A2Q9	502-026	Transistor		2N2905A
A2Q10	502-005	Transistor		2N697
A2R1		Not Used		
A2R2		Not Used		
A2R3		Not Used		
A2R4		Not Used		
A2R5		Not Used		
A2R6		Not Used		
A2R7		Not Used		
A2R8		Not Used		
A2R9		Not Used		
A2R10		Not Used		
A2R11		Not Used		
A2R12	304-005	1000 ohm 10% 1/2W WW LinVar	91637	2387
A2R13		Not Used		
A2R14		Not Used		
A2R15		Not Used		
A2R16		Not Used		

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
207-151

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2R17		Not Used		
A2R18		Not Used		
A2R19		Not Used		
A2R20		Not Used		
A2R21		Not Used		
A2R22		Not Used		
A2R23		Not Used		
A2R24		Not Used		
A2R25		Not Used		
A2R26		Not Used		
A2R27		Not Used		
A2R28		Not Used		
A2R29		Not Used		
A2R30		Not Used		
A2R31		Not Used		
A2R32		Not Used		
A2R33		Not Used		
A2R34	315-058	9090 ohm 1% 1/8W Met Film		RN60D9091F
A2R35	315-095	1.0 MEG ohm 1% 1/8W Met Film		RN60D1004F
A2R36	315-095	1.0 MEG ohm 1% 1/8W Met Film		RN60D1004F
A2R37	300-103	10K ohm 10% 1/4W Comp		RC07GF103K
A2R38	300-103	10K ohm 10% 1/4W Comp		RC07GF103K
A2R39	300-470	47 ohm 10% 1/4W Comp		RC07GF470K
A2R40	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A2R41	300-473	47K ohm 10% 1/4W Comp		RC07GF473K
A2R42	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A2R43	315-019	100K ohm 1% 1/8W Met Film		RN60D1003K
A2R44	300-470	47 ohm 10% 1/4W Comp		RC07GF470K
A2R45	300-152	1500 ohm 10% 1/4W Comp		RC07GF152K
A2R46	315-124	750K ohm 1% 1/8W Met Film		RN60D7503F
A2R47	300-103	10K ohm 10% 1/4W Comp		RC07GF103K
A2R48	300-100	10 ohm 10% 1/4W Comp		RC07GF100K
A2R49	315-014	3480 ohm 1% 1/8W Met Film		RN60D3481F
A2R50		Not Used		
A2R51	315-061	10K ohm 1% 1/8W Met Film		RN60D1002F
A2R52		Not Used		
A2R53	315-061	10K ohm 1% 1/8W Met Film		RN60D1002F
A2R54	304-005	1000 ohm 10% 1/2W WW LinVar	91637	2387
A2R55		Factory Selected		
A2R56	325-004	15K ohm .05% 1/8W WW	91637	MWA-10
A2R57		Not Used		
A2R58		Not Used		
A2R59		Not Used		
A2R60		Not Used		
A2R61		Not Used		

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
207-151

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2R62	300-152	1500 ohm 10% 1/4W Comp		RC07GF152K
A2R63	300-221	220 ohm 10% 1/4W Comp		RC07GF221K
A2R64	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A2R65	300-682	6800 ohm 10% 1/4W Comp		RC07GF682K
A2R66	301-331	330 ohm 10% 1/2W Comp		RC20GF331K
A2R67	315-049	1910 ohm 1% 1/8W Met Film		RN60D1911F
A2R68	315-	To be determined		RN60D
A2R69	300-471	470 ohm 10% 1/4W Comp		RC07GF471K
A2R70	315-057	8060 ohm 1% 1/8W Met Film		RN60D8061F
A2R71	315-061	10K ohm 1% 1/8W Met Film		RN60D1002F
A2R72		Not Used		
A2R73		Not Used		
A2R74		Not Used		
A2R76	306-003	0.68 ohm 10% 1W Comp	07716	BWH-1
A2R77	300-224	220K ohm 10% 1/4W Comp		RC07GF224K
A2R78	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A2R79	300-221	220 ohm 10% 1/4W Comp		RC07GF221K
A2R80	300-150	15 ohm 10% 1/4W Comp		RC07GF150K
A2R81	300-152	1500 ohm 10% 1/4W Comp		RC07GF152K
A2R82	315-088	15K ohm 1% 1/8W Met Film		RN60D1502F
A2R83	300-332	3300 ohm 10% 1/4W Comp		RC07GF332K
A2R84		Factory Selected		
	233-007	Transistor Pad	07047	A10029
	233-011	I.C. Socket 14 Pin	91506	314-AG5D-2

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
TUNING & BIAS SUPPLY
207-153

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2	207-153	Tuning & Bias Supply		
A2C1	440-013	2.2 uf 10% 20V Tant	56289	1500225X9020A2
A2C2	430-011	0.1 uf 10% 50V Mylar	84411	601PE
A2C3	430-011	0.1 uf 10% 50V Mylar	84411	601PE
A2C4		Not Used		
A2C5	430-013	0.0033 uf 10% 600V Mylar	56289	6PS-D33
A2C6	430-027	0.01 uf 10% 50V Mylar	84411	601PE
A2C7		Not Used		
A2C8	430-027	0.01 uf 10% 50V Mylar	84411	601PE
A2C9	430-011	0.1 uf 10% 50V Mylar	84411	601PE
A2C10		Not Used		
A2C11	430-032	0.22 uf 10% 50V Mylar	84411	601PE
A2C12	430-017	0.047 uf 10% 50V Mylar	84411	601PE
A2C13	420-035	0.002 uf 20% 1KV Cer	56289	5GA-D20
A2C14	400-043	10 uf -10+100% 25V Elect	56289	TE1204
A2C15	400-041	100 uf -10+100% 25V Elect	56289	TE1211
A2C16	460-221	220 pf 10% 500V Mica	84171	DM15-221
A2C17	430-019	4700 pf 10% 50V Mylar	84411	601PE
A2CR1		Not Used		
A2CR2		Not Used		
A2CR3		Not Used		
A2CR4		Not Used		
A2CR5		Not Used		
A2CR6		Not Used		
A2CR7		Not Used		
A2CR8		Not Used		
A2CR9		Not Used		
A2CR10		Not Used		
A2CR11		Not Used		
A2CR12		Not Used		
A2CR13		Not Used		
A2CR14		Not Used		
A2CR15		Not Used		
A2CR16	500-010	Diode		IN914
A2CR17	500-010	Diode		IN914
A2CR18	501-013	Diode, Zener		IN749A
A2CR19		Not Used		
A2CR20	500-019	SCR		2N4441
A2CR21		Not Used		
A2CR22		Not Used		
A2CR23	500-010	Diode		IN914
A2CR24	500-010	Diode		IN914

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
TUNING & BIAS SUPPLY
207-153

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2CR25	500-010	Diode		IN914
A2CR26	500-013	Diode		IN914
A2CR27	501-010	Diode		IN914
A2CR28		Not Used		
A2CR29	500-010	Diode		IN914
A2CR30	500-010	Diode		IN914
A2CR31		Not Used		
A2CR32	500-010	Diode		IN914
A2CR33	500-010	Diode		IN914
A2CR34	500-010	Diode		IN914
A2CR35	500-010	Diode		IN914
A2CR36	500-010	Diode		IN914
A2CR37	500-010	Diode		IN914
A2IC1	503-001	I.C. Amplifier	01295	SN72709N
A2IC2	503-001	I.C. Amplifier	01295	SN72709N
A2K1A	216-002	Relay Coil	18786	MR107
A2K1B	211-014	Reed	95348	20-50A-T
A2Q1	502-024	Transistor		2N5184
A2Q2		Not Used		
A2Q3	502-026	Transistor		2N2905A
A2Q4	502-010	Transistor		2N3707
A2Q5	502-010	Transistor		2N3707
A2Q6	502-031	Transistor		2N4045
A2Q7	502-013	Transistor		2N3703
A2Q8	502-013	Transistor		2N3703
A2Q9	502-026	Transistor		2N2905A
A2Q10	502-005	Transistor		2N697
A2Q11	502-010	Transistor		2N3707
A2R1		Not Used		
A2R2		Not Used		
A2R3		Not Used		
A2R4		Not Used		
A2R5		Not Used		
A2R6		Not Used		
A2R7		Not Used		
A2R8		Not Used		
A2R9		Not Used		
A2R10		Not Used		
A2R11		Not Used		

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
TUNING & BIAS SUPPLY
207-153

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2R12	304-005	1000 ohm 10% 1/2W WW LinVar	91637	2387
A2R13		Not Used		
A2R14		Not Used		
A2R15		Not Used		
A2R16		Not Used		
A2R17		Not Used		
A2R18		Not Used		
A2R19		Not Used		
A2R20		Not Used		
A2R21		Not Used		
A2R22		Not Used		
A2R23		Not Used		
A2R24		Not Used		
A2R25		Not Used		
A2R26		Not Used		
A2R27		Not Used		
A2R28		Not Used		
A2R29		Not Used		
A2R30		Not Used		
A2R31		Not Used		
A2R32		Not Used		
A2R33		Not Used		
A2R34	315-061	10K ohm 1% 1/8W Met Film		RN60D1002F
A2R35	315-095	1.0 Meg ohm 1% 1/8W Met Film		RN60D1004F
A2R36	315-095	1.0 Meg ohm 1% 1/8W Met Film		RN6-D1004F
A2R37	300-103	10K ohm 10% 1/4W Comp		RC07GF103K
A2R38	300-103	10K ohm 10% 1/4W Comp		RC07GF103K
A2R39	300-470	47 ohm 10% 1/4W Comp		RC07GF470K
A2R40	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A2R41	300-473	47K ohm 10% 1/4W Comp		RC07GF473K
A2R42	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A2R43	315-019	100K ohm 1% 1/8W Met Film		RN60D1003F
A2R44	300-470	47 ohm 10% 1/4W Comp		RC07GF470K
A2R45	300-102	1000 ohm 10% 1/4W Comp		RC07GF102K
A2R46	315-124	750K ohm 1% 1/8W Met Film		RN60D7503F
A2R47	300-103	10K ohm 10% 1/4W Comp		RC07GF103K
A2R48	300-100	10 ohm 10% 1/4W Comp		RC07GF100
A2R49	315-014	3480 ohm 1% 1/8W Met Film		RN60D3481F
A2R50		Not Used		
A2R51	315-061	10 K ohm 1% 1/8W Met Film		RN60D1002F
A2R52		Not Used		
A2R53	315-061	10K ohm 1% 1/8W Met Film		RN60D1002F
A2R54	304-005	1000 ohm 10% 1/2W WW LinVar	91637	2387
A2R55	325-	To be determined		

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
TUNING & BIAS SUPPLY
207-153

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A2R56	325-004	15K ohm .05% 1/8W WW	91637	MWA-10
A2R57		Not Used		
A2R58		Not Used		
A2R59		Not Used		
A2R60		Not Used		
A2R61		Not Used		
A2R62	300-152	1500 ohm 10% 1/4W Comp		RC07GF152K
A2R63	300-221	220 ohm 10% 1/4W Comp		RC07GF221K
A2R64	315-026	1870 ohm 1% 1/8W Met Film		RN60D1871F
A2R65	300-682	6800 ohm 10% 1/4W Comp		RC07GF682K
A2R66	301-681	680 ohm 10% 1/2W Comp		RC20GF681K
A2R67	315-049	1910 ohm 1% 1/8W Met Film		RN60D1911F
A2R68	315-	To be determined		RN60D
A2R69	300-471	470 ohm 10% 1/4W Comp		RC07GF471K
A2R70	315-057	8060 ohm 1% 1/8W Met Film		RN60D8061F
A2R71	315-061	10K ohm 1% 1/8W Met Film		RN60D1002F
A2R72	300-471	470 ohm 10% 1/4W Comp		RC07GF471K
A2R73		Not Used		
A2R74		Not Used		
A2R75	305-017	1.28 ohm 1% 3W WW		RW79V1R28F
A2R76	300-027	2.7 ohm 10% 1/4W Comp		RC07GF2R7K
A2R77	300-224	220K ohm 10% 1/4W Comp		RC07GF224K
A2R78	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A2R79	300-221	220 ohm 10% 1/4W Comp		RC07GF221K
A2R80	300-150	15 ohm 10% 1/4W Comp		RC07GF150K
A2R81	300-152	1500 ohm 10% 1/4W Comp		RC07GF152K
A2R82	315-088	15K ohm 1% 1/8W Comp		RN60D1502F
A2R83	300-332	3300 ohm 10% 1/4W Comp		RC07GF332K
A2R84		Selected at test		
A2R85	315-	6810 ohm 1% 1/8W Met Film		RN60D6811F
	233-007	Transistor Pad	07047	A10029
	233-011	I.C. Socket 14 Pin	91506	314AG5D-2

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
FM AMPLIFIERS
207-135

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A3	207-135	FM Amplifier		
A3C1	430-017	.047 uf 10% 50V Mylar	84411	601PE
A3C2	430-002	.001 uf 10% 600V Mylar	56289	6PS-D10
A3C3	430-032	.22 uf 10% 50V Mylar	84411	601PE
A3C4	430-002	.001 uf 10% 600V Mylar	56289	6PS-D10
A3CR1	500-001	Diode	14099	SCE-2
A3CR2	501-014	Diode, Zener		IN989
A3F1	212-008	Fuse 0.25 AMP	75915	312.250
A3Q1	502-026	Transistor		2N2905A
A3Q2	502-026	Transistor		2N2905A
A3Q3	502-005	Transistor		2N697
A3R1	305-071	78.7 ohm 3% 3W WW		RW79U78R7F
A3R2	315-054	1000 ohm 1% 1/8W Met Film		RN60D1001F
A3R3	300-222	2200 ohm 10% 1/4W Comp		RC07GF222K
A3R4	315-034	27.4K ohm 1% 1/8W Met Film		RN60D2742F
A3R5	300-221	220 ohm 10% 1/4W Comp		RC07GF221K
A3R6	300-332	3300 ohm 10% 1/4W Comp		RC07GF332K
A3R7	300-222	2200 ohm 10% 1/4W Comp		RC07GF222K
A3R8	300-100	10 ohm 10% 1/4W Comp		RC07GF100K
A3R9	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A3R10	300-472	4700 ohm 10% 1/4W Comp		RC07GF472K

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
207-152

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A3	207-152	FM Amplifier		
A3C1	430-017	.047uf 10% 50V Mylar	84411	601PE
A3C2	430-002	.001uf 10% 600V Mylar	56289	6PS-D10
A3C3	430-017	.047uf 10% 50V Mylar	84411	601PE
A3C4	430-002	.001uf 10% 600V Mylar	56289	6PS-D10
A3CR1	500-005	Diode	14099	SCE-2
A3CR2	504-014	Diode, Zener		IN989
A3F1	212-005	Fuse 1.0 Amp	75915	312.3AG
A3Q1	502-026	Transistor		2N2905A
A3Q2	502-026	Transistor		2N2905A
A3Q3	502-005	Transistor		2N697
A3R1		Not Used		
A3R2	315-054	1000 ohm 1% 1/8W Met Film		RN60D1001F
A3R3	300-222	2200 ohm 10% 1/4W Comp		RC07GF222K
A3R4	315-034	27.4K ohm 1% 1/8W Met Film		RN60D2742F
A3R5	300-221	220 ohm 10% 1/4W Comp		RC07GF221K
A3R6	300-332	3300 ohm 10% 1/4W Comp		RC07GF332K
A3R7	300-222	2200 ohm 10% 1/4W Comp		RC07GF222K
A3R8	300 6R8	6.8 ohm 10% 1/4W Comp		RC07GF6R8K
A3R9	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A3R10	300-152	1500 ohm 10% 1/4W Comp		RC07GF152K

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
R.F. ASSEMBLY
250-027

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A4	250-027	R.F. ASSEMBLY		
A4A1	571-004	Oscillator/Diode Modulator (231A, -1 & -2)	18786	
A4A1	571-010	Oscillator without D.M. (231A-3)	18786	
A4A2	576-007	Diode Modulator (Option-3)	17540	MT3026
A4AT1	578-003	Isolator (Option-3)	16453	ICL-4748
A4CR1	576-008	Crystal Detector D114 (Option-1)	18786	
A4DC1	575-015	Directional Coupler (Option-1)	14862	70711
A4R1		Not Used		
A4R2	305-046	147 ohm 3% 3W WW		RW79U1470F
A4R3	305-046	147 ohm 3% 3W WW		RW79U1470F
A4R4	300-332	3300 ohm 10% 1/4W Comp		RC07GF332K
A4W1	240-049	Cable Assy Semi-Rigid	18786	
A4W2	240-046	Cable Assy Semi-Rigid	18786	
A4W3	240-050	Cable Assy Semi-Rigid	18786	
	205-231	Chassis, R.F. Comp		
	205-230	Bracket		
	205-272	Plate, Support		
	234-051	Conn. Adapter "SMA" M/M (Option-3)	26805	2081-0000

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
R. F. ASSEMBLY
250-028

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A4	250-028	R.F. Assembly		
A4A1	571-012	Oscillator (Model 232A)	18786	
A4A1	571-011	Oscillator (Model 242A)	18786	
A4A2	576-007	Diode Modulator	17540	MT3026
A4CR1	576-008	Crystal Detector D114 (Option-1)	18786	
A4CR2		Not Used		
A4CR3		Not Used		
A4CR4	501-025	Diode, Zener		IN4733A
A4CR5	501-024	Diode, Zener	12969	UZ5722
A4DC1	575-014	Directional Coupler (Option-1)	14862	70712
A4J3	234-035	Connector, P.C. 15 Pin	26742	91-6015-1100-00
A4R1	326-68R1	68.1 ohm 1% 10W WW	OMI	HT-10
A4W1	240-047	Cable Assy Semi-Rigid	18786	
A4W2	240-046	Cable Assy	18786	
	205-231	Chassis, R.F. Comp		
	205-230	Bracket		
	205-228	Clamp Support		
	205-229	Clamp Support		
	234-051	Conn. Adapter "SMA" M/M (Option-1)	26805	2081-0000

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
250-030

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A4	250-030	RF Assembly		
A4A1	571-007	Oscillator	14482	WJ-5008
A4A2	576-007	Diode Modulator	17540	MT3026
A4AT1	578-006	Isolator, 8-12.4 GHz	18786	
A4CR1	576-012	Crystal Detector, HD113 (Option-1)	18786	
A4CR1	501-024	Diode, Zener	12969	UZ5722
A4DC1	575-004	Directional Coupler	18786	
A4J3	234-035	Connector P.C. 15 Pin	26742	91-6015-1100-00
A4R1	326-150	15 ohm 1% 25W WW	OM1	HT-25
A4W1	240-063	Cable Assembly - Semi-Rigid	18786	
A4W2	240-046	Cable Assembly - Semi-Rigid	18786	
A4W3		Not Used		
	234-057	Conn. Adapter "M" to "N"	26805	2081-2301
	205-231	Chassis - RF Component	18786	
	205-282	Bracket, Support	18786	
	205-229	Clamp Support	18786	
	234-051	Conn. Adapter "SMA" M/M	26805	2081-0000
	205-230	Bracket	18786	

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
R.F. ASSEMBLY
250-053

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A4	250-053	R.F. ASSEMBLY		
A4A1	571-005	Solid State Osc.-Heterdyne		
A4A2		Not Used		
A4A3	250-035	.01-1GHz Amplifier		
A4A4	580-005	Mixer	05375	DBM-400
A4AT2	573-007	Termination	26805	2021-6100
A4CR1	576-008	Crystal Detector D114		
A4CR2	500-010	Diode		1N914
A4DC1	575-015	Directional Coupler	14862	7071J
A4J1	234-061	Connector Receptacle 24 Pin	02660	57-20240
A4K1	210-040	Relay, Coax	12598	CS-221R
A4R1	304-039	1K/1K ohm 20% 1/2W WW Var Tandem		
A4R2		P/O R1		
A4R3	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A4R4		Not Used		
A4R5	305-046	147 ohm 3% 3W WW		RW79U1470F
A4R6	305-046	147 ohm 3% 3W WW		RW79U1470F
A4R7	300-100	10 ohm 10% 1/4W Comp		RC07GF100K
A4R8		Selected at test		
A4R9	300-332	3300 ohm 10% 1/4W Comp		RC07GF332K
A4R10		Selected at test		

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
R.F. ASSEMBLY
250-031

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A4	250-031	R.F. ASSEMBLY		
A4A1	571-005	Solid State Osc. Heterdyne		
A4A2		Not Used		
A4A3	250-035	.01-1 GHz Amplifier		
A4A4	580-005	Mixer	05375	DBM-400
A4AT1	573-006	Attenuator - "SMA" Conn.	23042	RA-51
A4AT2	573-007	Termination	26805	2021-6100
A4CR1	576-008	Crystal Detector D114		
A4CR2	500-010	Diode		1N914
A4DC1	575-015	Directional Coupler	14862	70711
A4J1	234-061	Connector Receptacle 24 Pin	02660	57-20240
A4K1	210-040	Relay, Coax	12598	CS221R
A4R1	304-034	1000 ohm 20% 1/4W WW Var		
A4R2	304-005	1000 ohm 10% 1/2W WW Var	91637	2387
A4R3	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A4R4	300-500	50 ohm 10% 1/4W Comp		RC07GF500K
A4R5	305-046	147 ohm 3% 3W WW		RW79U1470F
A4R6	305-046	147 ohm 3% 3W WW		RW79U1470F
A4R7	300-100	10 ohm 3% 3W WW		RW79U1470F
A4R8		Selected at test		
A4R9	300-332	3300 ohm 10% 1/4W Comp		RC07GF332K
A4R10		Selected at test		

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
R.F. ASSEMBLY
250-056

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A4	250-056	R.F. ASSEMBLY		
A4A1	571-013	Oscillator		
A4A2	576-007	Diode Modulator	17540	MT3026
A4AT1	578-006	Isolator, 8-12.4 GHz	18786	
A4CR1	576-012	Crystal Detector, HD113	18786	
A4DC1	575-004	Directional Coupler	18786	
A4J3	234-035	Connector P.C. 15 Pin	26742	91-6015-1100-00
A4R1	326-150	15 ohm 1 % 25W WW	OM1	HT-25
A4W1	240-063	Cable Assembly-Semi Rigid	18786	
A4W2	240-046	Cable Assembly-Semi Rigid	18786	
A4W3		Not Used		
	234-057	Conn. Adapter "N" to "SMA"	26805	2081-2301
	205-231	Chassis - R.F. Component		
	204-097	Heatsink Top		
	204-098	Heatsink, Bottom		
	201-060	Terminal, Solderless	00779	324598
	234-051	Conn. Adapter "SMA" M/M	26805	2081-000
	201-048	Spacer	06540	8150A-0632
	839-701	Lug, Solder	83330	1416-6
	205-230	Bracket		
A4CR4	501-027	Diode, Zener	12969	UZ5708
A4CR5	501-028	Diode, Zener	12969	UZ5709

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
SYM SWP SWITCH
250-008

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A5	250-008	Symmetrical Sweep Switch Assy		
A5S1	210-025	Switch	18786	
A5R1	P/O 210-025	10K ohm Pot		
A5R2	315-015	6980 ohm 1% 1/8W Met Film		RNR60C6981F
A5R3	315-014	3480 ohm 1% 1/8W Met Film		RNR60C3481F
A5R4	315-011	1400 ohm 1% 1/8W Met Film		RNR60C1401F
A5R5	315-010	698 ohm 1% 1/8W Met Film		RNR60C6980F
A5R6	315-009	348 ohm 1% 1/8W Met Film		RNR60C3480F
A5R7	315-006	140 ohm 1% 1/8W Met Film		RNR60C1400F
A5R8	315-005	69.8 ohm 1% 1/8W Met Film		RNR60C69R8F
A5R9	315-004	34.8 ohm 1% 1/8W Met Film		RNR60C34R8F
A5R10	315-001	14.0 ohm 1% 1/8W Met Film		RNR60C14R0F

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
SYM SWP SWITCH
250-011

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A5	250-011	Symmetrical Sweep Switch Assy		
A5S1	210-025 P/O	Switch	18786	
A5R1	210-025	10K ohm Pot		
A5R10	315-002	17.4 ohm 1% 1/8W Met Film		RNR60D17R4F
A5R9	315-004	34.8 ohm 1% 1/8W Met Film		RNR60D34R8F
A5R8	315-005	69.8 ohm 1% 1/8W Met Film		RNR60D69R8F
A5R7	315-007	174 ohm 1% 1/8W Met Film		RNR60D1740F
A5R6	315-009	348 ohm 1% 1/8W Met Film		RNR60D3480F
A5R5	315-010	698 ohm 1% 1/8W Met Film		RNR60D6980F
A5R4	315-012	1740 ohm 1% 1/8W Met Film		RNR60D1741F
A5R3	315-014	3480 ohm 1% 1/8W Met Film		RNR60D3481F
A5R2	315-015	6980 ohm 1% 1/8W Met Film		RNR60D6981F

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
SYM SWP SWITCH
250-043

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A5	250-043	Symmetrical Sweep Switch Assy		
	P/O			
A5R1	210-025	10K ohm Pot		
A5R2	315-015	6980 ohm 1% 1/8W Met Film		RN60D6981F
A5R3	315-013	2800 ohm 1% 1/8W Met Film		RN60D2801F
A5R4	315-011	1400 ohm 1% 1/8W Met Film		RN60D1401F
A5R5	315-010	698 ohm 1% 1/8W Met Film		RN60D6980F
A5R6	315-008	280 ohm 1% 1/8W Met Film		RN60D2800F
A5R7	315-006	140 ohm 1% 1/8W Met Film		RN60D1400F
A5R8	315-005	69.8 ohm 1% 1/8W Met Film		RN60D69R8F
A5R9	315-003	28.0 ohm 1% 1/8W Met Film		RN60D28R0F
A5R10	315-001	14.0 ohm 1% 1/8W Met Film		RN60D14R0F
A5S1	210-025	Switch, Rotary	18786	

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
250-071

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A5	250-051	Symmetrical Sweep Switch Ass'y		
A5S1	210-025 P/O	Switch		
A5R1	210-025	10K ohm Pot		
A5R10	315-127	15.8 ohm 1% 1/8W Met Film		RN60D15R8F
A5R9	315-128	31.6 ohm		RN60D31R6F
A5R8	315-129	63.4 ohm 1% 1/8W Met Film		RN60D63R4F
A5R7	315-130	158 ohm 1% 1/8W Met Film		RN60D1580F
A5R6	315-131	316 ohm 1% 1/8W Met Film		RN60D3160F
A5R5	315-132	634 ohm 1% 1/8W Met Film		RN60D6340F
A5R4	315-133	1580 ohm 1% 1/8W Met Film		RN60D1581F
A5R3	315-027	3160 ohm 1% 1/8W Met Film		RN60D3161F
A5R2	315-134	6340 ohm 1% 1/8W Met Film		RN60D6341F

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
250-032

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A5	250-032	Symmetrical Sweep Switch Ass'y		
A5S1	210-025 P/O	Switch	18786	
A5R1	210-025	10K ohm Pot		
A5R2	315-015	6980 ohm 1% 1/8W Met Film		RNR60C6981F
A5R3	315-014	3480 ohm 1% 1/8W Met Film		RNR60C3481F
A5R4	315-011	1400 ohm 1% 1/8W Met Film		RNR60C1401F
A5R5	315-010	698 ohm 1% 1/8W Met Film		RNR60C6980F
A5R6	315-009	348 ohm 1% 1/8W Met Film		RNR60C3480F
A5R7	315-006	140 ohm 1% 1/8W Met Film		RNR60C1400F
A5R8	315-005	69.8 ohm 1% 1/8W Met Film		RNR60C69R8F
A5R9	315-004	34.8 ohm 1% 1/8W Met Film		RNR60C34R8F
A5R10	315-001	14.0 ohm 1% 1/8W Met Film		RNR60C14R0F

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
LEVELER SWITCH
250-012

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A6	250-012	Leveler Switch		
A6S1	210-029	Switch	18786	
A6R1	300-103	10K ohm 10% 1/4W Comp		RCR07G103K

TABLE 7-4 (CONT'D)
REPLACEABLE PARTS
LEVELER SWITCH
250-046

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A6	250-046	Leveler Switch		
A6S1	210-042	Switch	18786	
A6R1	300-203	20K ohm 10% 1/4W Comp		RC07GF203K
A6R2	300-222	2200 ohm 10% 1/4W Comp		RC07GF222K
A6R3	300-222	2200 ohm 10% 1/4W Comp		RC07GF222K
A6R4		Selected at test		
A6C1	440-044	220 uf 10% 10V Tant	56289	150D227X901052
A6C2	440-044	220 uf 10% 10V Tant	56289	150D227X901052

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
BASIC PLUG-IN ASSY
250-007

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A7	250-007	Basic Plug-in Assy		
A7C1		See Table 7-3		
A7CR1	500-005	Diode	14099	SCE2
A7CR2	500-010	Diode		IN914
A7DS1	214-006	Lamp, Indicator	07137	MCL-A-2-NE2E
A7F1		Fuse (see Table 7-3)	05915	2AG
A7J1	234-0D	Connector, P.C. 24 Pin	26742	91-6024-1100-00
A7J2	234-019	Connector, P.C. 24 Pin	26742	91-6024-1100-00
A7J3	234-003	Connector BNC	81862	
A7J4		Not Used		
A7J5	234-003	Connector BNC	81862	
A7J6	234-003	Connector BNC	81862	
A7J7	234-003	Connector BNC	81862	
A7J8	234-003	Connector BNC	81862	
A7P1	234-054	Connector, Plug 36 Pin	02660	57-10360
A7Q1	502-030	Transistor (see Table 7-3)	01295	TIP-34A
A7Q2	502-019	Transistor (see Table 7-3)	89869	DTS-423
A7R1	304-044	10K/10K ohm 20% 1W Tandem	18786	
A7R2		P/O A7R1		
A7R3	304-036	1000 ohm 10% 1/2W WW LinVar	01121	WA2G056S 102UA
A7R4	300-470	47 ohm 10% 1/4W Comp		RC07GF470K
A7R5		See TAble 7-3 for Value		
A7R6		See Table 7-3 for Value		
A7R7		See Table 7-3 for Value		
A7R8		Not Used		
A7R9		Not Used		
A7R10		Not Used		
A7R11		Not Used		
A7R12	305-018	2.08 ohm 1% 3W WW		RW79U2R08F
A7R13	300-100	10 ohm 10% 1/4W Comp		RC07GF100K
A7R14		See Table 7-3 for Value		
A7TB1		Not Used		
A7TB2	236-004	Terminal Block & Contact	75382	410-Y-8
A7TB3	236-004	Terminal Block & Contact	75382	410-Y-8
A7W1	242-002	Harness	18786	
A7A2	240-048	Cable Assembly	18786	
	205-240	Panel, Front	18786	

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
BASIC PLUG-IN ASSY
250-007

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
	205-241	Panel, Rear	18786	
	205-234	Bracket, Connector	18786	
	205-289	Chassis, P.C. BD's	18786	
	205-235	Cover, Top	18786	
	205-236	Cover, Bottom	18786	
	205-237	Side Panel, Rt	18786	
	205-238	Side Panel, Lt	18786	
	205-239	Support, Center	18786	
	205-292	Bracket, BNC	18786	
	217-015	Knob, Rd, Skirt	21604	SSN-50-TSL-2 3/4 SKT BLK
	217-016	Knob, Rd, Skirt Conc	21604	70CTSC-2 7/8 SKT BLK
	217-012	Knob, Rd	21604	SSN-50-1 Short Red
	217-014	Knob, Rd	21604	SSN-50-2 BLK/WHT LINE
	201-050	Plug Button	83330	652
	201-049	Plug Button	83330	654
	228-003	Lock	24248	27-10-301-20

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
MAIN FRAME ASSY
250-054

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A7	250-054	Main Frame Assembly		
A7A1	571-006	1.2 GHz Fixed Osc.-Filter		
A7A2	250-045	Freq. Range Sw. Assy		
A7CR1	500-005	Diode	14099	SCE 2
A7CR2	500-010	Diode		IN914
A7CR3	500-010	Diode		IN914
A7CR4	500-010	Diode		IN914
A7DS1	214-006	Lamp, Indicator	07137	MCL-A-2-NE2E
A7F1	212-005	Fuse 1 Amp	75915	3AG
A7J1	234-019	Connector P.C. 24 Pin	26742	91-6024-1100-00
A7J2	234-019	Connector P.C. 24 Pin	26742	91-6024-1100-00
A7J3	234-003	Connector, "BNC"		
A7J4		Not Used		
A7J5	234-003	Connector BNC		UG1094A/U
A7J6	234-003	Connector BNC		UG1094A/U
A7J7	234-003	Connector BNC		UG1094A/U
A7J8	234-003	Connector BNC		UG1094A/U
A7J9	234-003	Connector BNC		UG1094A/U
A7K1	211-015	Relay	29238	67DP-H-6C3B
A7K2	210-040	Relay, Coax Switch	12598	CS-221R
A7P1	234-054	Connector Plug 36 Pin	02660	57-10360
A7P2	234-062	Connector Plug 24 Pin	02660	57-10240
A7Q1	502-030	Transistor	01295	TIP-34A
A7Q2		Not Used		
A7R1		Not Used		
A7R2		Not Used		
A7R3	304-036	1000 ohm 10% 1/2W WW LinVar	01121	WA2G056S102UA
A7R4	300-101	100 ohm 10% 1/4W Comp		RC07GF101K
A7R5		Not Used		
A7R6		Not Used		
A7R7	315-076	44.2K ohm 1% 1/8W Met Film		RN60D4422F
A7R8		Not Used		
A7R9		Selected at test		

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
MAIN FRAME ASSY
250-054

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A7R10		Not Used		
A7R11		Not Used		
A7R12	305-018	2.08 ohm 1% 3W WW		RW79U2R08F
A7R13	300-100	10 ohm 10% 1/4W Comp		RC07GF100K
A7R14	306-003	0.68 ohm 10% 1W Comp	81483	BWH-1
A7R15	301-681	680 ohm 10% 1/2W Comp		RC20GF681K
A7R16	304-029	50K ohm 10% 1/2W WW LinVar	91637	2387
A7TB1		Not Used		
A7TB2		Not Used		
A7TB3	236-004	Terminal Block 8 Contacts	75382	410-Y-8

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
MAIN FRAME ASSY
250-036

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A7	250-036	Main Frame Assembly		
A7A1	571-006	1.2 GHz Fixed Osc.-Filter		
A7A2	250-045	Freq. Range Sw. Assy		
A7CR1	500-005	Diode	14099	SCE2
A7CR2	500-010	Diode		IN914
A7CR3	500-010	Diode		IN914
A7CR4	500-010	Diode		IN914
A7DS1	214-006	Lamp, Indicator	07137	MCL-A-2-NE2E
A7F1	212-005	Fuse 1 Amp	75915	3AG
A7J1	234-019	Connector P.C. 24 Pin	26742	91-6024-1100-00
A7J2	234-019	Connector P.C. 24 Pin	26742	91-6024-1100-00
A7J3	234-003	Connector, "BNC"		UG1094A/U
A7J4		Not Used		
A7J5	234-003	Connector, "BNC"		UG1094A/U
A7J6	234-003	Connector, "BNC"		UG1094A/U
A7J7	234-003	Connector, "BNC"		UG1094A/U
A7J8	234-003	Connector, "BNC"		UG1094A/U
A7J9	234-003	Connector, "BNC"		UG1094A/U
A7K1	211-015	Relay	29238	67DP-H-6C3B
A7K2	210-040	Relay, Coax Switch	12598	CS-221R
A7P1	234-054	Connector Plug 36 Pin	02660	57-10360
A7P2	234-062	Connector Plug 24 Pin	02660	57-10240
A7Q1	502-030	Transistor	01295	TIP-34A
A7Q2		Not Used		
A7R1		Not Used		
A7R2		Not Used		
A7R3	304-036	1000 ohm 10% 1/2W WW LinVar	01121	WA2G056S 102UA
A7R4	300-470	47 ohm 10% 1/4W Comp		RC07GF470K
A7R5		Not Used		
A7R6		Not Used		
A7R7	315-076	44.2K ohm 1% 1/8W Met Film		RN60D4422F
A7R8		Not Used		
A7R9		Selected at test		

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
MAIN FRAME ASSY
250-036

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A7R10		Not Used		
A7R11		Not Used		
A7R12	305-018	2.08 ohm 1% 3W WW		RW79U2R08F
A7R13	300-100	10 ohm 10% 1/4W Comp		RC07GF100K
A7R14	306-003	0.68 ohm 10% 1W Comp	81483	BWH-1
A7R15AB	301-681	680 ohm 10% 1/2W Comp		RC20GF681K
A7R16	304-029	50K ohm 10% 1/2W WW LinVar	91637	2387
A7TB1		Not Used		
A7TB2		Not Used		
A7TB3	236-004	Terminal Block 8 Contacts	75382	410-Y-8

TABLE 7-4 (CONT'D)

REPLACEABLE PARTS
FREQ. RANGE SW. ASSY
250-045

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION	CODE IDENT	MFG PART NO.
A7A2	250-045	Frequency Range Sw. Assy		
A7R1	300-472	4700 ohm 10% 1/4W Comp		RC07GF472K
A7S1	210-035	Switch, Rotary SP3T		

TABLE 7-5

CODE LIST OF MANUFACTURERS

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements.

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
00000	U.S.A. Common	Any supplier of U.S.	04013	Taurus Corp.	Lambertsville, N.J.
00213	Sage Electronics Corp.	Rochester, N.Y.	04062	Arco Electronic Inc.	Great Neck N.Y.
00348	Microtron Co., Inc.	Valley Stream, N.Y.	04404	Dymec Div. of Hewlett-Packard Co.	Palo Alto, Calif.
00373	Garlock, Inc.	Cherry Hill, N.J.	04651	Sylvania Electric Products, Microwave Device Div.	Mountain View, Calif.
00656	Aerovox Corp.	New Bedford, Mass.	04713	Motorola, Inc., Semiconductor Prod. Div.	Phoenix, Ariz.
00779	Amp. Inc.	Harrisburg, Pa.	04732	Filtron Co., Inc. Western Div.	Culver City, Calif.
00853	Sangamo Electric Co., Pickens Div.	Pickens, S.C.	04773	Automatic Electric Co.	Northlake, Ill.
00929	Microlab, Inc.	Livingston, N.J.	04811	Precision Coil Spring Co.	El Monte, Calif.
01002	General Electric Co., Capacitor Dept.	Hudson Falls, N.Y.	05277	Westinghouse Electric Corp., Semi-Conductor Dept.	Youngwood, Pa.
01009	Alden Products Co.	Brockton, Mass.	05397	Union Carbide Corp. Linde Div., Kemet Dept.	Cleveland, Ohio
01121	Allen Bradley Co.	Milwaukee, Wis.	05574	Viking Ind., Inc.	Canoga Park, Calif.
01255	Litton Industries, Inc.	Beverly Hills, Calif.	05624	Barber Colman Co.	Rockford, Ill.
01281	TRW Semiconductors, Inc.	Lawndale, Calif.	05783	Stewart Engineering Co.	Santa Cruz, Calif.
01295	Texas Instruments, Inc., Transistor Products Div.	Dallas, Texas	05820	Wakefield Engineering, Inc.	Wakefield, Mass.
02660	Amphenol-Borg Electronics Corp.	Chicago, Ill.	06090	Raychem Corp.	Redwood City, Calif.
02735	Radio Corp. of America, Semiconductor & Materials Div.	Somerville, N.J.	06175	Bausch & Lomb Optical Co.	Rochester, N.Y.
02777	Hopkins Engineering Co.	San Fernando, Calif.	06540	Amaton Electronic Hardware Co., Inc.	New Rochelle, N.Y.
03508	G.E. Semiconductor Prod. Dept.	Syracuse, N.Y.	06555	Beede Electrical Instrument Co.; Inc.	Penacook, N.H.
03818	Parker Seal Co.	Los Angeles, Calif.	06812	Torrington Mfg., Co., West Div.	Van Nuys, Calif.
03877	Transitron Electric Corp.	Wakefield, Mass.			
04009	Arrow, Hart and Hegeman Elect. Co.	Hartford, Conn.			

TABLE 7-5 (CONT'D)

CODE LIST OF MANUFACTURERS (CONT'D)

Code No.	Manufacturer	Address
06980	Varian Assoc. Eimac Div.	San Carlos, Calif.
07065	Line Electric Co.	Parsippany, N.J.
07088	Kelvin Electric Co.	Van Nuys, Calif.
07126	Digitran Co.	Pasadena, Calif.
07137	Transistor Electronics Corp.	Minneapolis, Minn.
07138	Westinghouse Electric Corp., Electronic Tube Div.	Elmira, N.Y.
07149	Filmohm Corp.	New York, N.Y.
07233	Cinch-Graphik Co.	City of Industry, Calif.
07256	Silicon Transistor Corp.	Carle Place, N.Y.
07261	Avnet Corp.	Culver City, Calif.
07263	Fairchild Camera & Inst. Corp., Semiconductor Div.	Mountain View, Calif.
07322	Minnesota Rubber Co.	Minneapolis, Minn.
07387	Bircher Corp., The	Monterey Park, Calif.
07397	Sylvania Elect.Prod. Inc., Mt.View Operations	Mountain View, Calif.
07700	Technical Wire Products, Inc.	Cranford, N.J.
07829	Bodine Elect. Co.	Chicago, Ill.
07910	Continental Device Corp.	Hawthorne, Calif.
07933	Raytheon Mfg. Co., Semiconductor Div.	Mountain View, Calif.
07980	Hewlett-Packard Co., Boonton Radio Div.	Rockaway N.J.
08358	Burgess Battery Co.	Niagara Falls, Ontario, Can.
08524	Deutsch Fastener Corp.	Los Angeles, Calif.
08718	ITT Cannon Electric, Inc., Phoenix Div.	Phoenix, Ariz.
08727	National Radio Lab. Inc.	Paramus, N.J.
09569	Mallory Battery Co. of Canada, Ltd.	Toronto, Ontario, Can.
11236	CTS of Berne, Inc.	Berne, Ind.
11237	Chicago Telephone of California, Inc.	So. Pasadena, Calif.
11242	Bay State Electronics Corp.	Waltham, Mass.
11711	General Instrument Corp., Semiconductor Div., Products Group	Newark, N.J.
11870	Melabs, Inc.	Palo Alto, Calif.
12136	Philadelphia Handle Co.	Camden, N.J.
12574	Gulton Ind. Inc. Data System Div.	Albuquerque, N.M.
12697	Clarostat Mfg. Co.	Dover, N.H.
12881	Metex Electronics Corp.	Clark, N.J.
12954	Dickson Electronics Corp.	Scottsdale, Arizona
13103	Thermolloy	Dallas, Texas
13511	Amphenol Corp.	Los Gatos, Calif.
14099	Sem-Tech	Newbury Park, Calif.
14433	ITT Semiconductor, A Div. of Int. Telephone & Telegraph Corp.	West Palm Beach, Fla.
14493	Hewlett-Packard Co.	Loveland, Colo.
14655	Cornell Dublier Electric Corp.	Newark, N.J.
14674	Corning Glass Works	Corning, N.Y.
16179	Omni-Spectra Inc.	Detroit, Ill.
16758	Delco Radio Div. of G.M. Corp.	Kokoma, Ind.
18083	Clevelite Corp. Semiconductor Div.	Palo Alto, Calif.
18324	Signetics Corp.	Sunnyvale, Calif.
18486	TRW Elect.Comp. Div.	Des Plaines, Ill.

TABLE 7-5 (CONT'D)

CODE LIST OF MANUFACTURERS (CONT'D)

Code No.	Manufacturer	Address
18583	Curtis Instrument, Inc.	Mt. Kisco, N.Y.
18786	Micro-Power Inc.	Long Island City, N.Y.
18911	Durant Mfg. Co.	Milwaukee, Wisc.
24455	G.E. Lamp Div.	Nela Park, Cleveland, Ohio
24655	General Radio Co.	West Concord, Mass.
28520	Heyman Mfg. Co.	Kenilworth, N.J.
30817	Instrument Specialties Co., Inc.	Little Falls, N.J.
33173	G.E. Receiving Tube Dept.	Owensboro, Ky.
36196	Stanwyck Coil Products Ltd.	Hawkesbury, Ontario, Can.
37942	P.R. Mallory & Co. Inc.	Indianapolis, Ind.
42190	Muter Co.	Chicago, Ill.
44655	Ohmite Mfg. Co.	Skokie, Ill.
47904	Polaroid Corp.	Cambridge, Mass.
54294	Shallcross Mfg. Co.	Selma, N.C.
55026	Simpson Electric Co.	Chicago, Ill.
55933	Sonotone Corp.	Elmsford, N.Y.
56137	Spaulding Fibre Co., Inc.	Tonawanda, N.Y.
56289	Sprague Electric Co.	North Adams, Mass.
58474	Superior Electric Corp.	Bristol, Conn.
59730	Thomas & Betts Co.	Elizabeth, N.J.
60741	Triplett Electrical Inst. Co.	Bluffton, Ohio
63743	Ward-Leonard Electric Co.	Mt. Vernon, N.Y.
6459	Western Electric Co., Inc.	New York, N.Y.
65092	Weston Inst. Inc. Weston-Newark	Newark, N.J.
66346	Minnesota Mining & Mfg. Co. Revere Mincom Div.	St. Paul, Minn.
70276	Allen Mfg. Co.	Hartford, Conn.
70309	Allied Control	New York, N.Y.
70318	Allmetal Screw Product Co., Inc.	Garden City, New York
70417	Amplex, Div. of Chrysler Corp.	Detroit, Mich.
70485	Atlantic India Rubber Works, Inc.	Chicago, Ill.
70563	Amperite Co., Inc.	Union City, N.J.
70674	ADC Products, Inc.	Minneapolis, Minn.
70903	Belden Mfg. Co.	Chicago, Ill.
70998	Bird Electronic Corp.	Cleveland, Ohio
71002	Birnbach Radio Co.	New York, N.Y.
71041	Boston Gear Works Div. of Murray Co. of Texas	Quincy, Mass.
71218	Bud Radio, Inc.	Willoughby, Ohio
71279	Cambridge Thermionics Corp.	Cambridge, Mass.
71286	Camloc Fastener Corp.	Paramus, N.J.
71313	Cardwell Condenser Corp.	Lindenhurst, L.I., N.Y.
71400	Bussmann Mfg. Div. of McGraw-Edison Co.	St. Louis, Mo.
71436	Chicago Condenser Corp.	Chicago, Ill.
71450	CTS Corp.	Elkhart, Ind.
71468	ITT Cannon Electric Inc.	Los Angeles, Calif.
71590	Centralab Div. of Globe Union Inc.	Milwaukee, Wisc.
71616	Commercial Plastics Co.	Chicago, Ill.
71744	Chicago Miniature Lamp Works	Chicago, Ill.
71785	Cinch Mfg. Co., Howard B.Jones Div.	Chicago, Ill.

TABLE 7-5 (CONT'D)

CODE LIST OF MANUFACTURERS (CONT'D)

Code No.	Manufacturer	Address
71984	Dow Corning Corp.	Midland, Mich.
72259	Nytronics Inc.	Berkeley Heights, N.J.
72619	Dialight Corp.	Brooklyn, N.Y.
72765	Drake Mfg. Co.	Harwood Heights, Ill.
72825	Hugh H. Eby Inc.	Philadelphia, Pa.
72962	Elastic Stop Nut Corp.	Union, N.J.
73061	Hansen Mfg. Co. Inc.	Princeton, Ind.
73138	Helipot Div. of Beckman Inst., Inc.	Fullerton, Calif.
73445	Amperex Elect. Co.	Hicksville, L.I., N.Y.
73506	Bradley Semi-conductor Corp.	New Haven, Conn.
73559	Carling Electric, Inc.	Hartford, Conn.
73899	JFD Electronics Corp.	Brooklyn, N.Y.
73905	Jennings Radio Mfg. Corp.	San Jose, Calif.
73957	Groov-Pin Corp.	Ridgefield, N.J.
74276	Signalite Inc.	Neptune, N.J.
74861	Industrial Condenser Corp.	Chicago, Ill.
74970	E.F. Johnson Co.	Waseca, Minn.
75263	Keystone Carbon Co. Inc.	St. Marys, Pa.
75378	CTS Knights Inc.	Sandwich, Ill.
75382	Kulka Electric Corporation	Mt. Vernon N.Y.
75915	Littlefuse, Inc.	Des Plaines, Ill.
76005	Lord Mfg. Co.	Erie, Pa.
76487	James Millen Mfg. Co., Inc.	Malden, Mass.
76493	J.W. Miller Co.	Los Angeles, Calif.
76854	Oak Manufacturing Co.	Crystal Lake, Ill.
77221	Phanostran Instrument & Electric Co.	South Pasadena Calif.
77342	American Machine & Foundry Co., Potter & Brumfield Div.	Princeton, Ind.
77630	TRW Electronic Components Div.	Camden, N.J.
77638	General Instrument Corp., Rectifier Div.	Brooklyn, N.Y.
78189	Shakeproof Division of Illinois Tool Works	Elgin, Ill.
78277	Sigma	So.Braintree, Mass.
78488	Stackpole Carbon Co.	St. Marys, Pa.
78526	Stanwyck Winding Co.	Newburgh, N.Y.
78553	Tinnerman Products, Inc.	Cleveland, Ohio
79136	Waldes Kohinoor Inc.	Long Island City, N.Y.
79142	Veeder Root, Inc.	Hartford, Conn.
79963	Zierick Mfg. Corp.	New Rochelle, N.Y.
80813	Dimco Gray Co.	Dayton, Ohio
81073	Grayhill Co.	LaGrange, Ill.
81095	Triad Transformer Corp.	Venice, Calif.
81312	Winchester Elect. Div. Litton Ind., Inc.	Oakville, Conn.
81483	International Rectifier Corp.	El Segundo, Calif.
81860	Barry Controls Div. Barry Wright Corp.	Watertown, Mass.
81862	Electric Components Corp.	Addison, Ill.
82142	Jeffers Electronics Div. of Speer Carbon Co.	Du Bois, Pa.
82219	Sylvania Electric Products, Inc., Electronic Tube Div.	Emporium, Pa.

TABLE 7-5 (CONT'D)

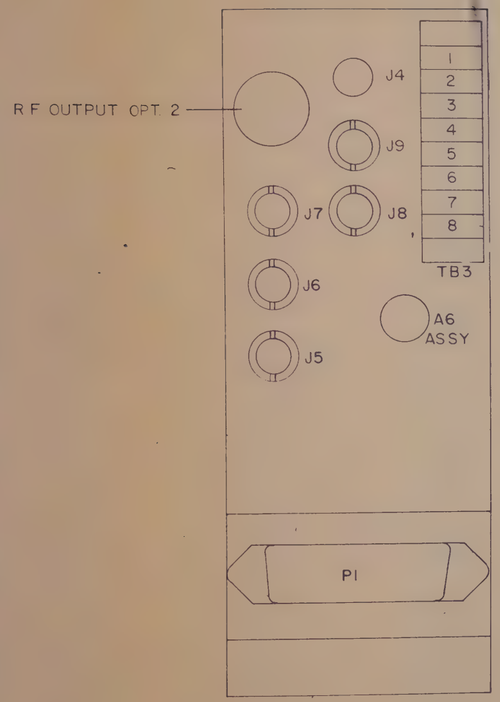
CODE LIST OF MANUFACTURERS (CONT'D)

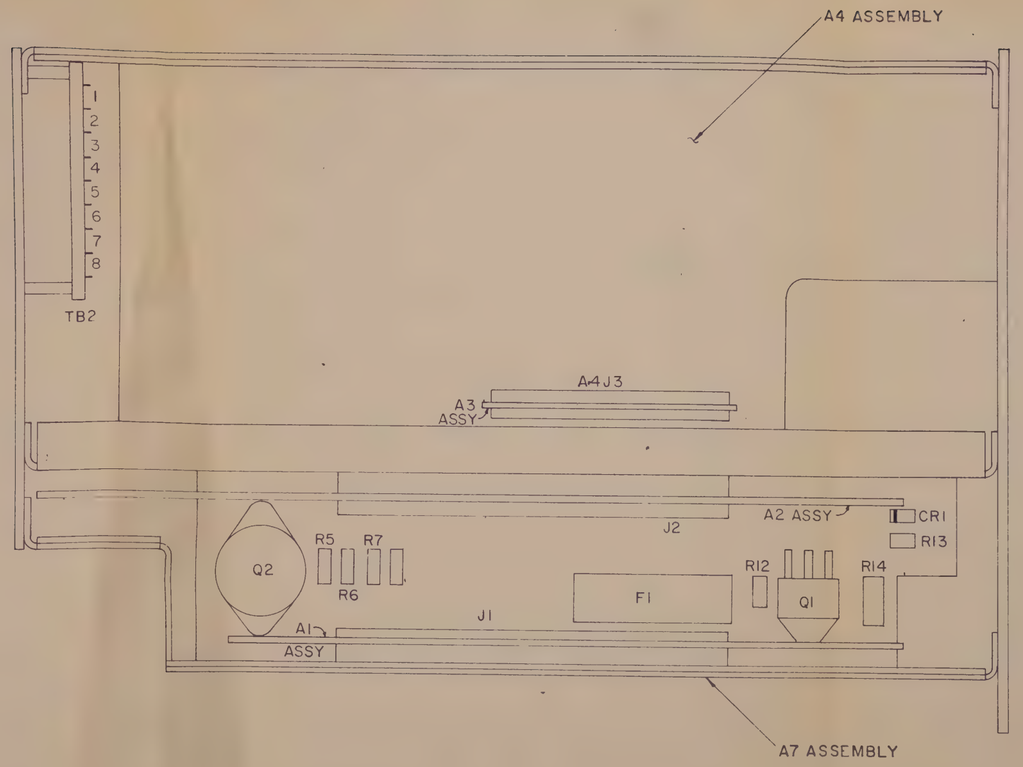
Code No.	Manufacturer	Address
82389	Switchcraft, Inc.	Chicago, Ill.
82866	Research Products Corp.	Madison, Wisc.
82877	Rotron Mfg. Co., Inc.	Woodstock, N.Y.
82893	Vector Electronic Co.	Glendale, Calif.
83058	Carr Fastener Co.	Cambridge, Mass.
83086	New Hampshire Ball Bearing, Inc.	Peterborough, N.H.
83148	ITT Wire and Cable Div.	Los Angeles, Calif.
83315	Hubbell Corp.	Mundelein, Ill.
83324	Rosan Inc.	Newport Beach, Calif.
83330	Smith, Herman H., Inc.	Brooklyn, N.Y.
83594	Burroughs Corp. Electronic Tube Div.	Plainfield, N.J.
83740	Union Carbide Corp. Consumer Prod. Div.	New York, N.Y.
84171	Arco Electronics Inc.	Great Neck, N.Y.
84411	TRW Capacitor Div.	Ogallala, Neb.
84970	Sarkes Tarzian, Inc.	Bloomington, Ind.
85454	Boonton Molding Company	Boonton, N.J.
86684	Radio Corp. of America, Electronic Comp & Devices Div.	Harrison, N.J.
87034	Marco Industries	Anaheim, Calif.
87930	Tower Mfg. Corp.	Providence, R.I.
88140	Cutler-Hammer, Inc.	Lincoln, Ill.
88220	Gould-National Batteries, Inc.	St. Paul, Minn.
89231	Graybar Electric Co.	Oakland, Calif.
90030	United Shoe Machinery Corp.	Beverly, Mass.
91146	ITT Cannon Elect.Inc. Salem Div.	Salem, Mass.
91345	Miller Dial & Nameplate Co.	El Monte, Calif.
91506	Augat Inc.	Attleboro, Mass.
91637	Dale Electronics, Inc.	Columbus, Nebr.
91662	Elco Corp.	Willow Grove, Pa.
91737	Gremar Mfg. Co.,	Wakefield, Mass.
91929	Honeywell Inc., Micro Switch Div.	Freeport Ill.
92702	IMC Magnetics Corp.	Westbury, L.I., N.Y.
92966	Hudson Lamp Co.	Kearney, N.J.
93332	Sylvania Electric Prod. Inc. Semiconductor Div.	Woburn, Mass.
93410	Stevens Mfg. Co., Inc.	Mansfield, Ohio
93929	G.V. Controls	Livingston, N.J.
94144	Raytheon Co., Comp. Div., Ind. Comp. Operations	Quincy, Mass.
94148	Scientific Electronics Products, Inc.	Loveland, Colo.
94154	Wagner Elect. Corp. Tung-Sol Div.	Newark, N.J.
94197	Curtiss-Wright Corp., Electronics Div.	East Paterson, N.J.
94375	Automatic Metal Products Co.	Brooklyn, N.Y.
95238	Continental Connector Corp.	Woodside, N.Y.
95263	Leecraft Mfg. Co., Inc.	Long Island, N.Y.
95265	National Coil Co.	Sheridan, Wyo.
95275	Vitramon, Inc.	Bridgeport, Conn.
95348	Gordos Corporation	Bloomfield, N.J.
95354	Methode Mfg. Co.	Rolling Meadows, Ill.
95566	Arnold Engineering	Marengo, Ill.
95712	Dage Electric Co. Inc.	Franklin, Ind.

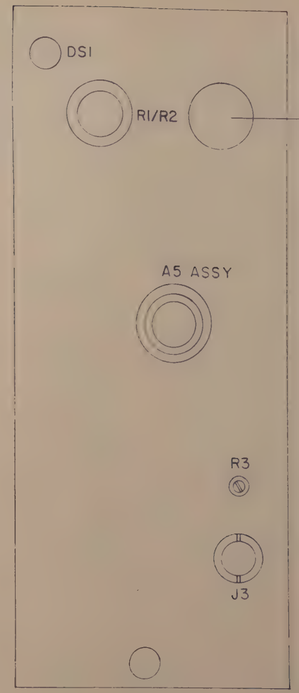
TABLE 7-5 (CONT'D)

CODE LIST OF MANUFACTURERS (CONT'D)

Code No.	Manufacturer	Address
95984	Siemon Mfg. Co.	Wayne, Ill.
95987	Weckesser Co.	Chicago, Ill.
96095	Hi-Q Div. of Aerovox Corp.	Olean, N.Y.
96341	Microwave Associates, Inc.	Burlington, Mass.
97983	Litton System Inc., Adler-Westrex Commun. Div.	New Rochelle, N.Y.
98220	Hewlett-Packard Co., Moseley Div.	Pasadena, Calif.
98278	Microdot, Inc.	So. Pasadena, Calif.
98291	Sealectro Corp.	Mamaroneck, N.Y.
98376	Zero Mfg. Co.	Burbank, Clif.
98821	North Hills Electronics, Inc.	Glen Cove, N.Y.
98978	International Electronic Research Corp.	Burbank, Calif.
99313	Varian Associates	Palo Alto, Calif.
99378	Atlee Corp.	Winchester, Mass.
99707	Control Switch Div. Controls Co. of America	El Segundo, Calif.
99942	Hoffman Electronics Corp. Semiconductor Div.	El Monte, Calif.
99957	Technology Instrument Corp. of Calif.	Newbury Park, Calif.







FRONT PANEL

FIG. 8-1
ASSEMBLY LOCATION
RF UNIT

TABLE 8-1

(FOR SYMBOLS NOT SHOWN IN THIS TABLE REFER TO MIL-STD-15)

SEMICONDUCTORS

DIODE, SEMICONDUCTOR

BREAKDOWN DIODE, UNIDIRECTIONAL

TRANSISTOR, NPN

TRANSISTOR, PNP

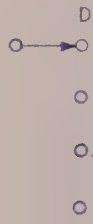
TRANSISTOR, FET

CAPACITIVE DIODE

CRYSTAL

SCR

SWITCHES



SWITCH, MULTIPOSITION NON-SHORTING

INPUTS, OUTPUTS & TERMINATIONS

SEPARABLE CONNECTORS (ENGAGED)

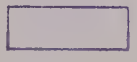
SIGNAL RETURN GROUND

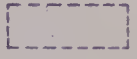
LIKE DESIGNATED CIRCUIT RETURNS WITHIN A SINGLE SCHEMATIC ARE CONNECTED

CONTROLS & ADJUSTMENTS

SCREWDRIVER ADJUSTMENT

TEST POINT


ADJUSTMENT OR CONTROL LOCATED ON FRONT PANEL


ADJUSTMENT OR CONTROL LOCATED ON REAR PANEL

MISCELLANEOUS

SIGNAL PATH

FEEDBACK OR SUBSIDIARY SIGNAL PATH

NOTE: UNLESS OTHERWISE SPECIFIED, ALL CAPACITANCES ARE IN PICOFARADS, INDUCTANCES IN MICROHENRIES, AND RESISTANCES IN OHMS, 1/4 W, 10%

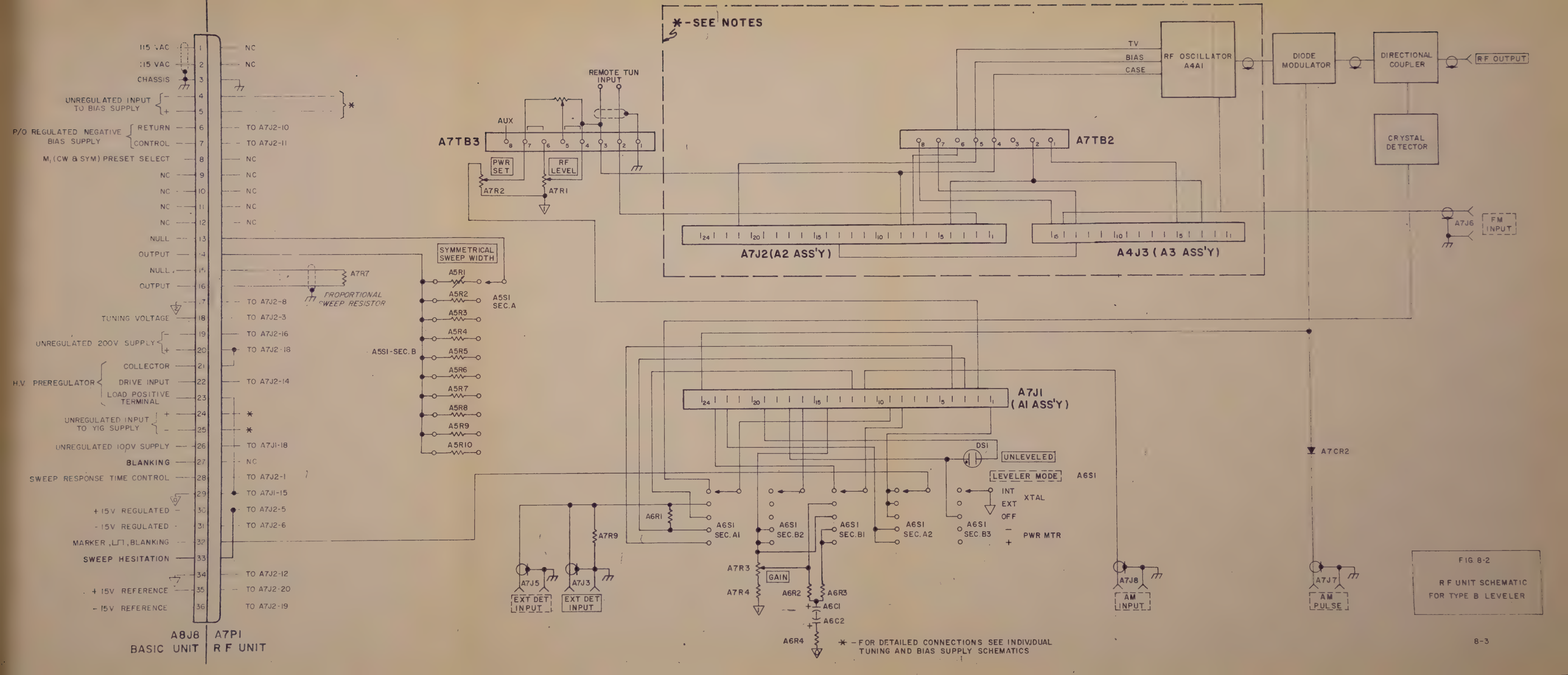


FIG. 8-2

R F UNIT SCHEMATIC FOR TYPE B LEVELER

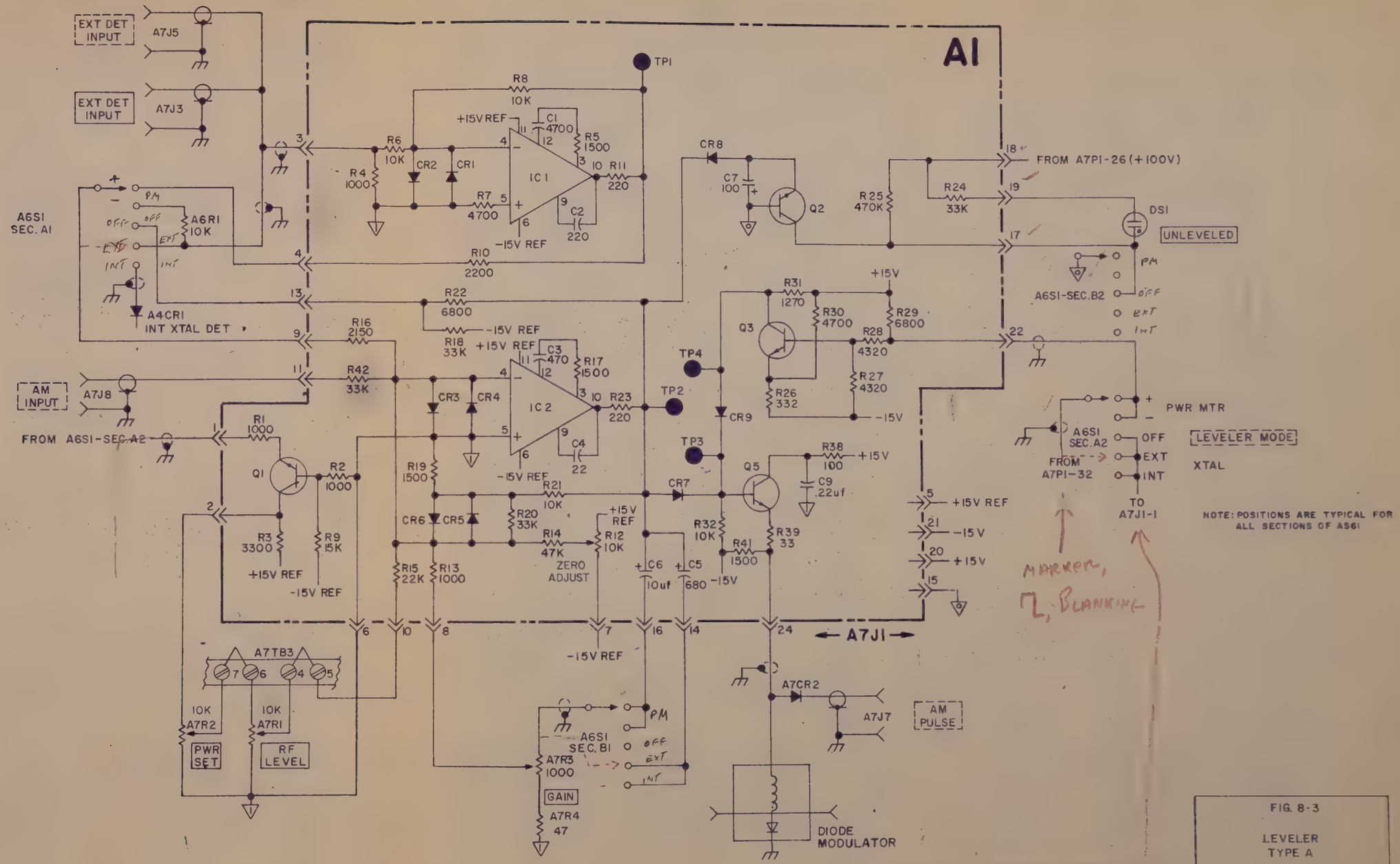


FIG. 8-3

LEVELER
TYPE A

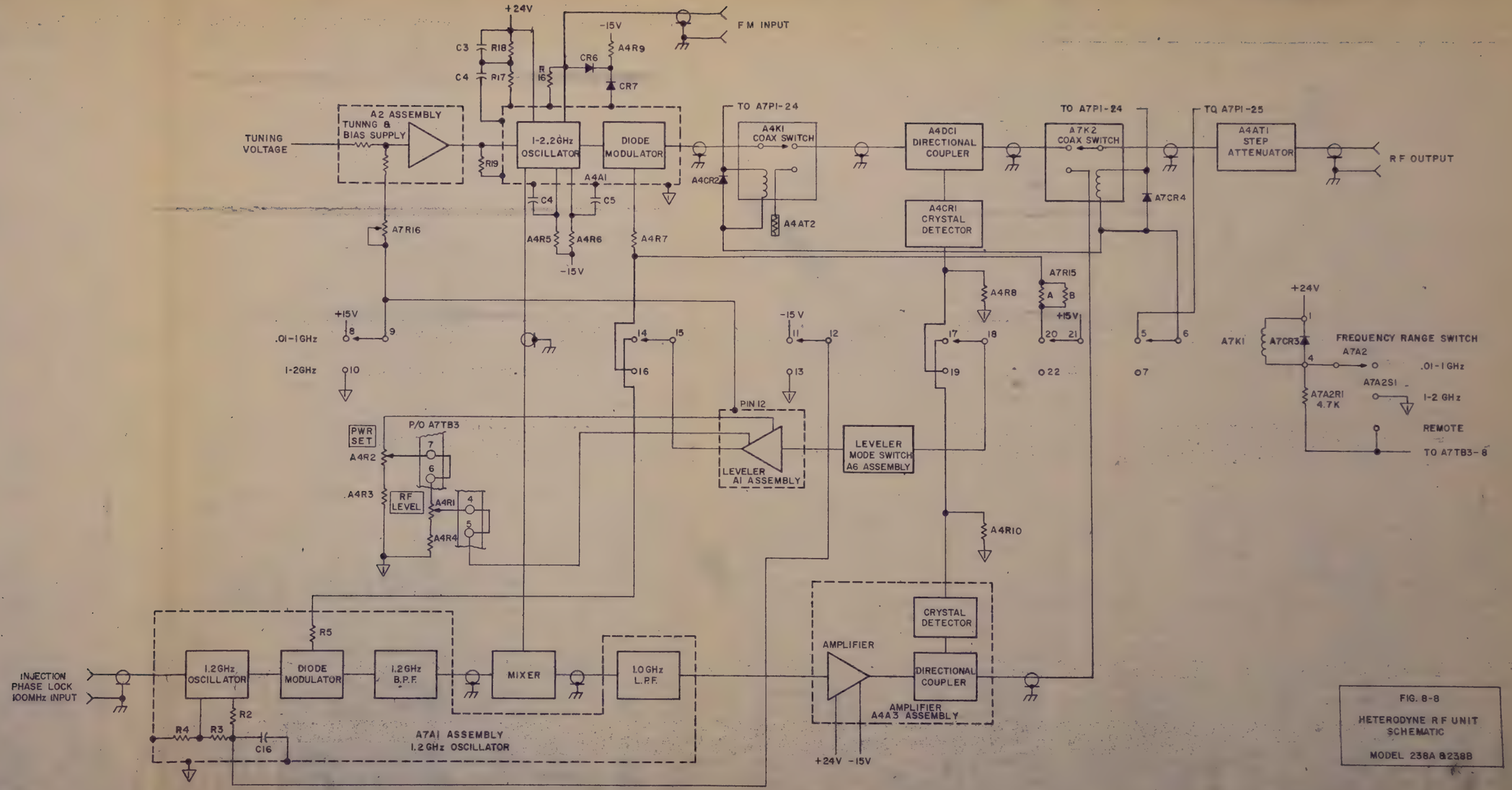


FIG. 8-8

HETERODYNE R F UNIT SCHEMATIC

MODEL 238A &238B

WARRANTY

MICROWAVE OSCILLATOR

The Microwave oscillator installed in the instrument is unconditionally warranted to be free from manufacturing defects for a period of 12 months from date of shipment from Micro-Power. Should the device fail during the warranty period as a result of a manufacturing defect, it may be returned to the Micro-Power factory for repair or replacement at no cost. Oscillators received damaged or with evidence of tampering do not qualify. If an oscillator which has failed during the warranty period is replaced with another one, the replacement unit will be warranted for the balance of the original 12 month period.

Oscillator Return Procedure

No allowance will be made for returned oscillators which are broken on arrival at the factory. Oscillators must be packed and shipped according to the instructions below, and the service information form must be properly completed and included in the carton.

1. Carefully wrap in a 1/4 inch thick "kimpack" cotton batting, or other soft padding material.
2. Wrap the above in heavy kraft paper.
3. Pack in a rigid container which provides a 4 inch minimum distance all around the unit.
4. Surround the unit with at least 4 inches of pack excelsior or similar shock absorbing material. Be certain that the packing is tight all around.
5. Mark the container FRAGILE and ship PREPAID via Air Freight or Railway Express. Do Not ship via Parcel Post or Air Parcel Post.

9/70

WARRANTY

All Micro-Power, Inc. products are warranted to the original purchaser against defective material and workmanship for a period of one year after date of initial shipment. Our liability is limited to repairing or replacing any defective part with the exception of microwave oscillators provided:

1. Micro-Power, Inc. is notified in writing upon discovery of such defects, noting the model, serial number and a brief statement of the fault, and

2. The defective product is returned to us, transportation charges prepaid by the purchaser.

3. The examination of such product by Micro-Power, Inc. shall disclose to its satisfaction that such defects exist and have not been caused by improper installation or application, neglect, repair, alteration, misuse or accident.

Under no circumstances shall Micro-Power, Inc. be liable for collateral or consequential damages of any nature.

This warranty is in lieu of all other warranties, expressed or implied.

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